DECEMBER • 1953

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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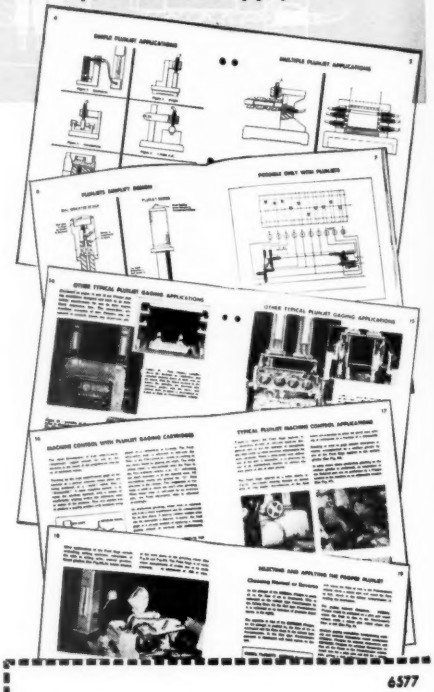

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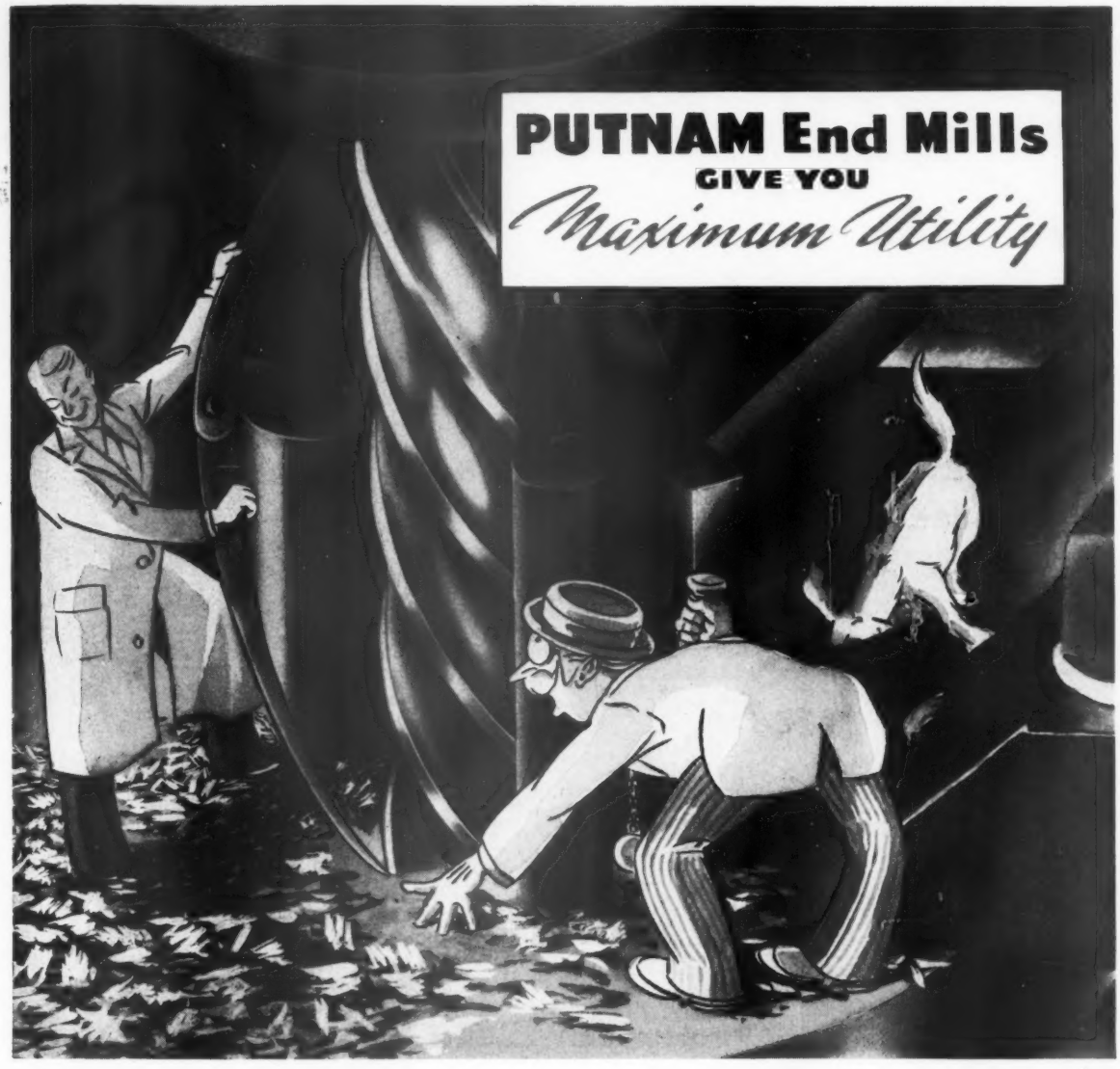

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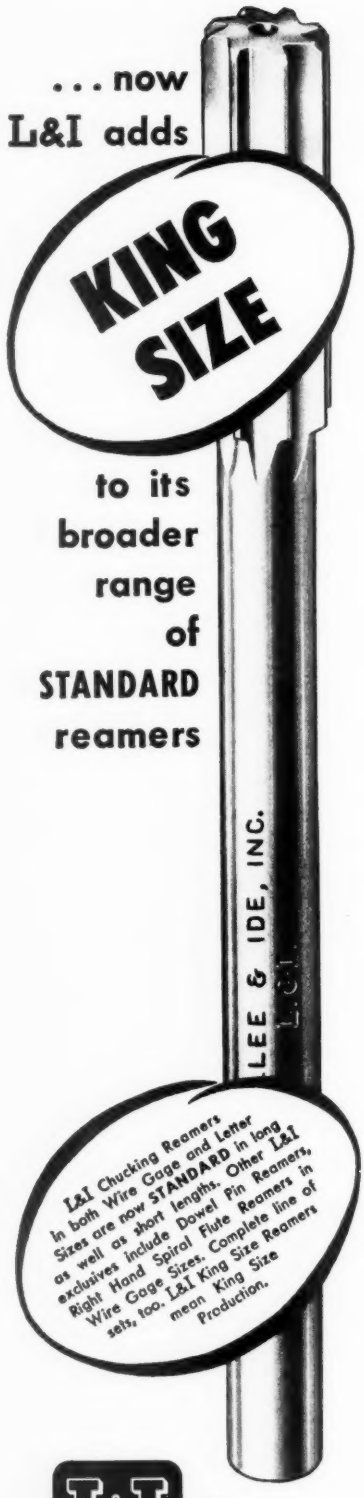
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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

Vol. XIX—No. 9 December, 1953

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They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

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Published monthly by HUEBNER PUBLICATIONS, Inc.

Editorial and Business Offices:
1975 Lee Road, Cleveland 18, Ohio
FAirmount 1-4040

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*Publishing Office:
112 East Chestnut Street
Louisville 2, Kentucky

*Ship plates ONLY to this Office.

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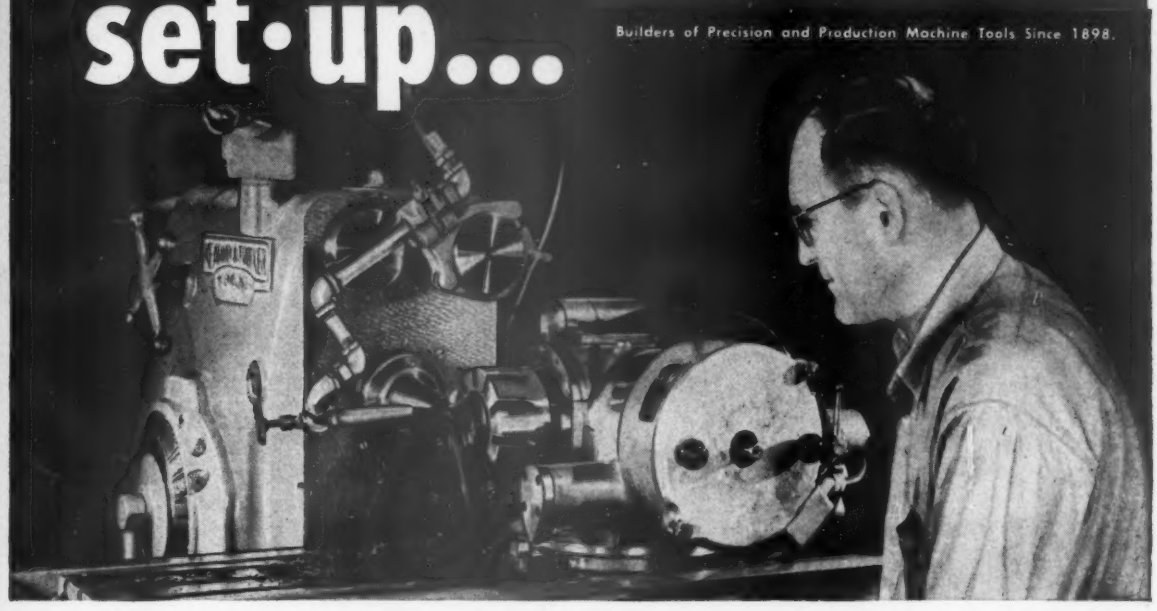

for the customer...it put a one-at-a-time indexing job on a production basis!

for the operator...only one motion controls entire indexing and milling operation!

THIS Universal Automatic Indexing Attachment, used in conjunction with the automatic cycle table movement on a Kearney & Trecker milling machine, eliminated a tedious dividing head job. A large midwest machine tool builder found this setup ideal for milling slots in face-milling cutter bodies.

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NOTCH PLATES CONTROL ACTUAL INDEXING . . . up to 24 divisions possible . . . plates changed in a matter of seconds . . . can be indexed two ways, automatically and manually.

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CIRCLE INFORM-A-GRAM KEY NO. 7

The Old Fashioned Plug Is Out Moded In This Fast-Rolling MODERN Age

Users everywhere say:

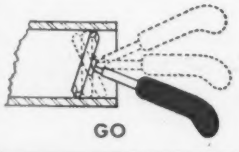
DuBo* is the MODERN Plug Gage

*U.S. and Foreign Patents Granted

Gaging Surfaces are Portions of a Sphere

Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!



COLOR Gives INSTANTANEOUS "FOOL-PROOF" INDICATION of GO and NO GO

For Quality Control

NO plug gage can equal DuBo

. . . IN ACCURACY

. . . IN EASE OF HANDLING

. . . IN SENSITIVITY

. . . IN LIGHT WEIGHT

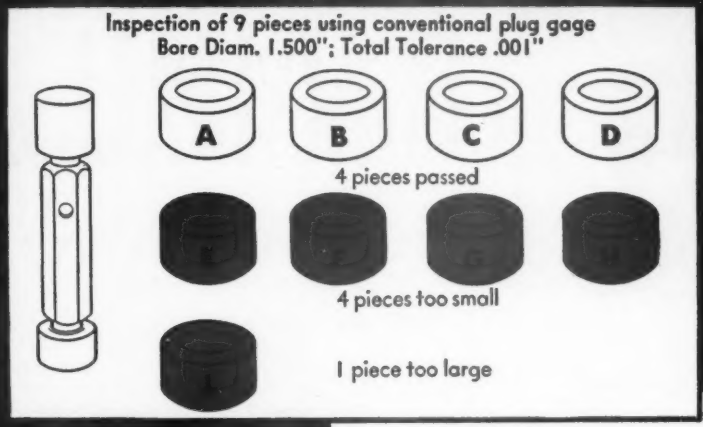
. . . IN LONG TERM SERVICE

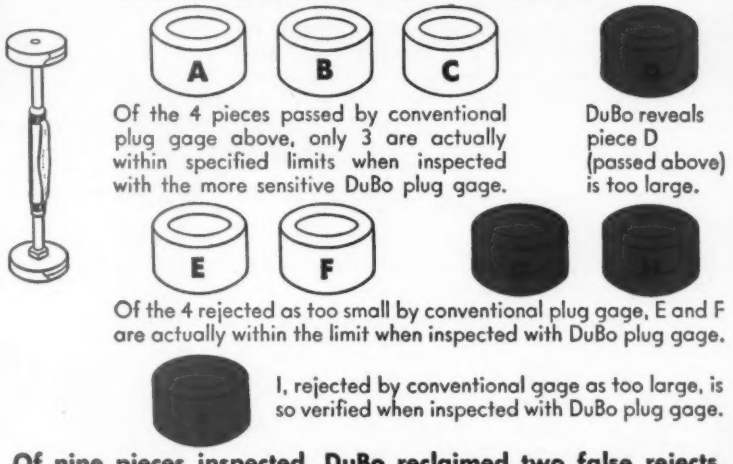
. . . IN COST SAVING AND PROFIT

Like so many items of modern design, DuBo Plug Gage *looks* different and *feels* different from the conventional plug gage. And even craftsmen of the old school, used to time-worn methods, quickly get the feel and take pride in the use of this *different* tool. *Added to that are the many actual cases where DuBo, after a fair trial, has replaced conventional plug gages.*

With exceptional ease of handling, DuBo gives a precise, definite and sensitive check of bore diameters, directly and with no element of confusion, even in unskilled hands. In the same application, DuBo reveals dimensional variations such as taper and out-of-round which ordinary plug gages cannot indicate.

An ABC Demonstration of DuBo* Plug Gage Superiority




RESULTS of same inspection using DuBo Plug Gage
A
B
C
Of the 4 pieces passed by conventional plug gage above, only 3 are actually within specified limits when inspected with the more sensitive DuBo plug gage.
DuBo reveals piece D (passed above) is too large.
E
F
Of the 4 rejected as too small by conventional plug gage, E and F are actually within the limit when inspected with DuBo plug gage.
I, rejected by conventional gage as too large, is so verified when inspected with DuBo plug gage.

Of nine pieces inspected, DuBo reclaimed two false rejects and rejected one piece that had been passed by ordinary plug gage inspection. Apply even a fraction of this ratio to a day's production in your own plant and you'll realize the advantage of using DuBo Plug Gages.

COST-SAVING FACTORS

DuBo Plug Gages outlast ordinary plugs many times. Extremely light in weight (in the larger sizes, 70% to 80% lighter than cylindrical plug gages of equivalent diameter) and requiring no jockeying into position for entry, DuBo effects economies in that important cost item, actual inspection time.

Use DuBo for Precision Plug Economy

When inspecting parts under quality control sampling procedure, it is important that those parts which may be close to either end of the tolerance range be properly classified. The definiteness and simplicity of DuBo gaging is a decided advantage in this type of inspection. Anyone who has tried to enter a cylindrical plug into a hole only .0001" larger than the gage, knows how difficult it is. For even skillful workers there is a point at which it becomes doubtful whether the bore is actually smaller than the gage size, or if it is larger and merely close. With DuBo Plug Gage, even an unskilled worker can easily enter the gage under any condition and quickly interpret bore conditions correctly. There need be no border-line cases of doubt regarding the proper classification of a bore. Use of the DuBo Plug Gage minimizes the cost of parts needlessly rejected and the expense accruing from those incorrectly passed.

TRY DuBo! Sense its craftsmanlike feel and balance. See how easily it enters, even in undersize bores . . . how gentle manipulation of the handle accurately reveals internal conditions. Use it on a *fussy* job and you'll KNOW why DuBo is replacing old time plug gages everywhere! Refer to Catalog C, Pages 18, 19, 20, 21. Or, write or phone for more detailed information.

modern machines demand CLOSER tolerances

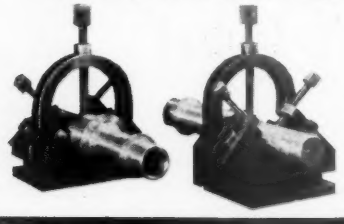
THIS "BRAIN CHILD WITH A MEMORY" can perform and check *14,000 computing operations a minute, without tiring or complaining! It's IBM's Electronic Calculator, Type 607, designed for use by business and industry. Now multiple machine operations can be done and checked in a single operation.*

MODEL 3000

dimensions 2-7/32" x 3¾" x 2-5/16"
Will nest up to 2½" diameter in the "V". Materials, hardness, stabilization same as Model 5000.

features Matched pairs are guaranteed to be square and parallel and concentric to each other to an extreme degree of accuracy.

Key slot in base is located on center and parallel to "V" to within .0002. There is a hole of ⅝" diameter thru the center of the "V" for picking up the center within .0002. Block is grooved all around for easy clamping to machine or layout plate. Two hold-down cleats are furnished with each block. The hoop clamps are hardened for long life.

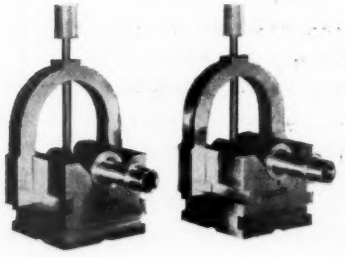


MODEL 5000

dimensions 4-3/16" x 5⅛" x 5⅜"
Will nest up to 4¼" diameter in "V". Made of forged chrome-moly alloy steel, accurately heat-treated and drawn to obtain a hardness of 58 to 60 Rockwell C scale. UNI-V-BLOCKS are subjected to a closely controlled metallurgical phase stabilization process, used for attaining a complete dimensionally stable condition in the block—a costly process used only by manufacturers of the highest quality master checking tools.

features Matched pairs are guaranteed to be square and parallel and concentric to each other to an extreme degree of accuracy, never before obtained in blocks this size.

Key slot in base is located on center and parallel to the "V" within .0003. Block is grooved front and rear for easy clamping on a machine table and layout plates. Husky clamps are provided for holding piece in the "V"; clamps are heat treated for long life.



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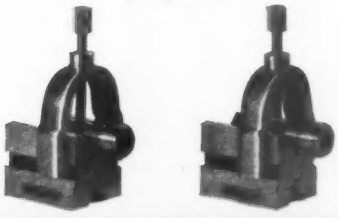
MODEL 1250

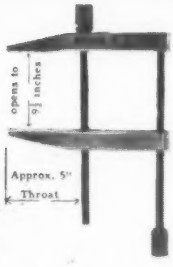
dimensions 1¼" x 1¼" x 1⅝". Made of high grade tool steel, heat treated to 58/60 Rockwell C scale.
Will nest up to 1" diameter.

features Matched pairs are guaranteed to be square and parallel and concentric to each other within .0002.
Two heat treated and hardened hoop clamps are furnished with each pair. Sold only in pairs.



Machines that "think", electronic "brains" that do all but talk are changing the face of industry. Dimensional control is now a must. UNI-V-BLOCKS were engineered to meet this need in the search for perfection. They hold to tolerances never before obtained in tools of this size. Made of forged Chrome Moly, they are guaranteed to "stay put." Special low temp treatments give them stability found only in master gauge blocks. They *are* the finest—check them yourself.

make tough problems easy



MODEL TC9500

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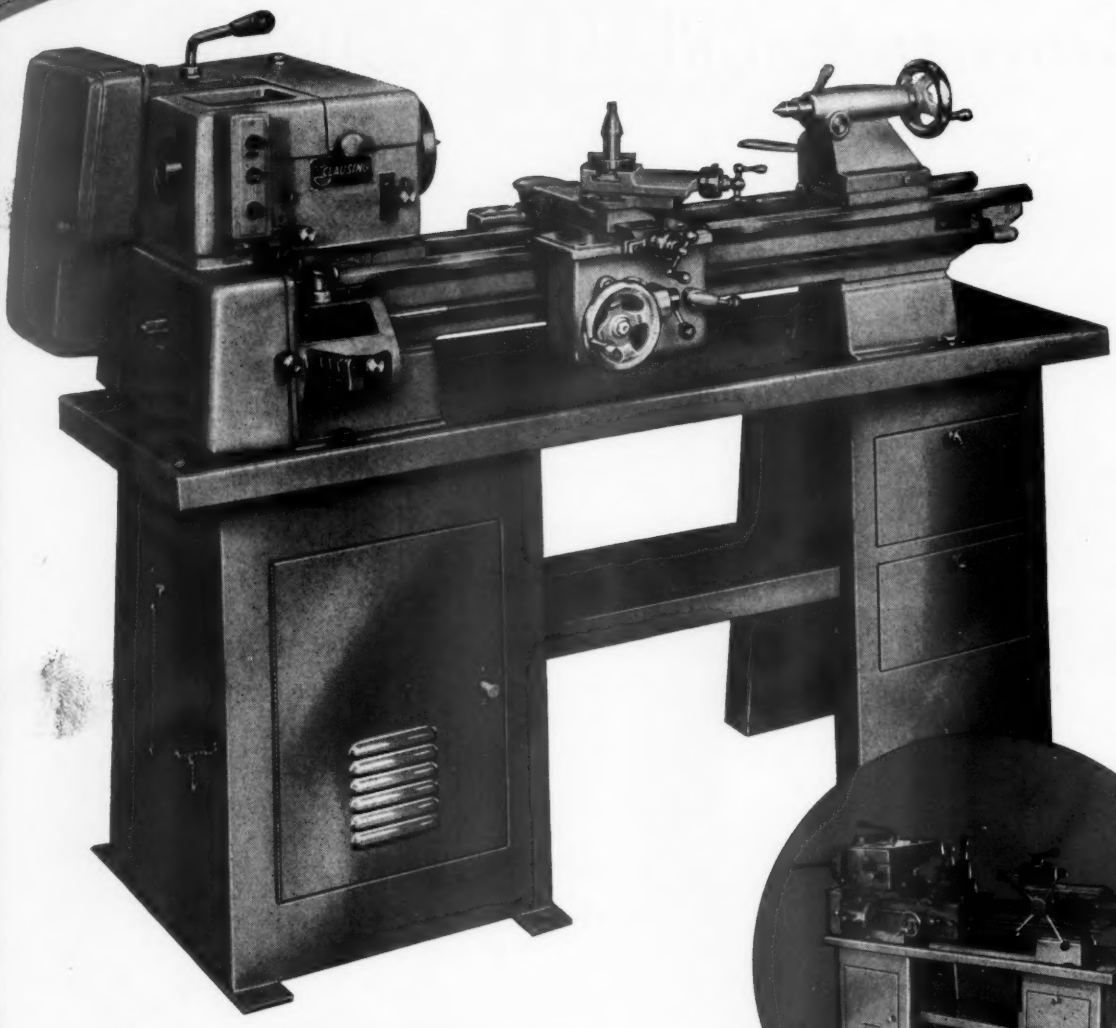

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CAPACITY	Swing: 12¾" over bed; 12½" over saddle wings; 8½" over saddle. 24"-36"-48" between centers.
THREAD RANGE	48 selections. 4 to 224 Standard, right or left.
SPINDLE SPEEDS	Direct: 173, 272, 454, 492, 780, 1300 RPM. Backgeared: 29, 46, 77, 83, 132, 220 RPM.
SPINDLE	Nose, 2¼" - 8 threads. Bored for No. 4½ MT, with reducing sleeve to take No. 3 MT 1⅜" hole thru spindle. 1" collet capacity.
COUNTERSHAFT DRIVE	Built-in, with clutch and brake. ⅝" wide B-belts. 3-step spindle pulley, 2-step motor pulley.

No. 5300 Clausing lathe equipped with lever type collet chuck, lever type carriage turret, bed turret for production hand turret operations.

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PRECISION MACHINE TOOLS
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For production capacity, accuracy and profit potential, the brilliant new CLAUSING 5300 gives you more *Plus Value* features than have ever before been available in a 1" collet capacity lathe . . . at or near its price!

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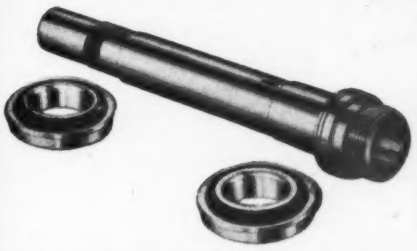
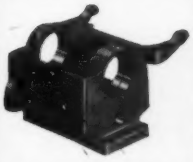
QUICK CHANGE MECHANISM Provides instant selection of 48 threads or feeds. ½" wide steel gears. Ground shafts turn on ball bearings. Plunger-type selector control.

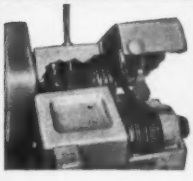
PRECISION GROUND BED Massive, semi-steel bed is 7¾" wide, 5⅛" deep — thickly ribbed and braced. Vee-ways, flat ways and undersides are ground. Built-in screw-type leveling jacks.



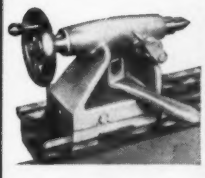
BIG PRECISION SPINDLE WITH "ZERO-PRECISION" BEARINGS. Precision ground, forged steel spindle turns on widely spaced heavy-duty Timken "Zero-Precision" tapered roller bearings — bearing run-out tolerance is .00015.



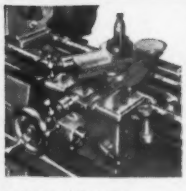
MASSIVE HEADSTOCK Massive headstock casting weighs 45 lbs. Heavy duty construction, plus malleable iron countershaft bracket anchored and doweled to casting to bridge drive opening, assure accurate alignment and rigidity for "the heart of the lathe."



CLUTCH AND BRAKE EQUIPPED COUNTERSHAFT Friction clutch-brake that permits instant starts and stops of spindle without stopping motor. Belts are fully guarded.



LARGE TAILSTOCK Heavy-duty tailstock has No. 3 MT ram with tang socket. Swing-type wrench, permanently attached, controls bed lock.



DOUBLE-WALLED AUTOMATIC APRON ½" wide gears and precision ground steel shafts run in bath of oil — power feeds engaged by positive clutch. New, large, easy-to-read feed dials.

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1" COLLET CAPACITY LATHES

Whether your dies are simple...

you can speed production, save time and money,

1 Simple pierce and cutoff die, designed for Electric Auto-Lite Co., Toledo, operates at speeds faster than 400 strokes per minute. Die has produced over 2,000,000 strokes . . . and still does not require resharpening.

Actual performance records prove carbide dies effective over wide range of uses

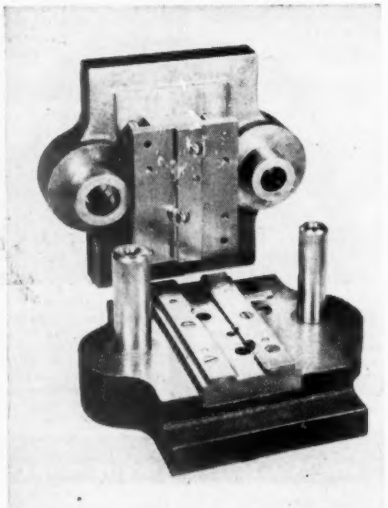
ACTUAL plant performance has proved how easy and profitable it is to use Carboloy cemented carbide over a wide range of applications. For blanking, forming, drawing and piercing . . . for large or small, simple or complex dies . . . only carbides will give you benefits like these:

- **Production runs 35 times greater than steel (see picture No. 7)**
- **Over two million high-speed strokes . . . without needing resharpening (see picture No. 1)**
- **Accurate tolerances held for months . . . compared to days with steel (see picture No. 6)**

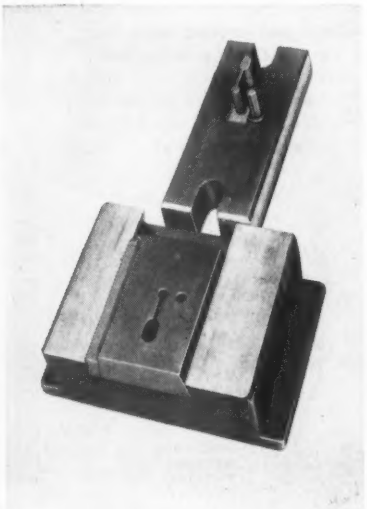
Read the case histories on these pages. They are but a few from the wide range of carbide press-die applications. Then explore the possibilities of carbide in your press dies. Carboloy personnel and services will give you or your die maker every possible assistance.

If you wish, a Carboloy Sales Engineer will call at your plant, without obligation. He'll show you how simple it is to apply and maintain carbide dies; how to get increased production with fewer rejects. Or, you can send your key personnel to the Carboloy Training School in Detroit.

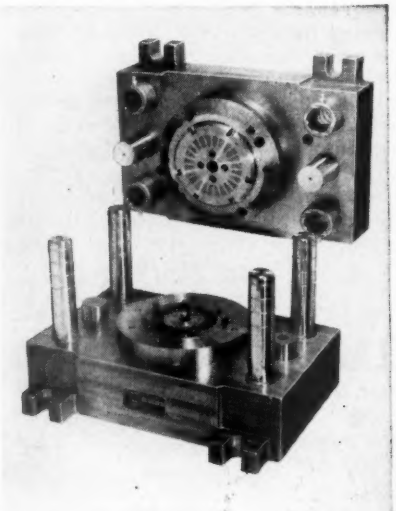
Also, you can get free Carboloy Die Engineering Manual D-124. It shows you how easy it is to design, apply and maintain carbide dies. Get all these free, profit-building Carboloy services by mailing the coupon at right.



2 Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks spring-tempered steel washers. This die delivers several million hits per sharpening.



3 Notching die, wearproofed with Carboloy cemented carbide, stands up under severe day-after-day pounding. Because carbide wears 10 to 50 times longer than steel, maintenance costs are lower.

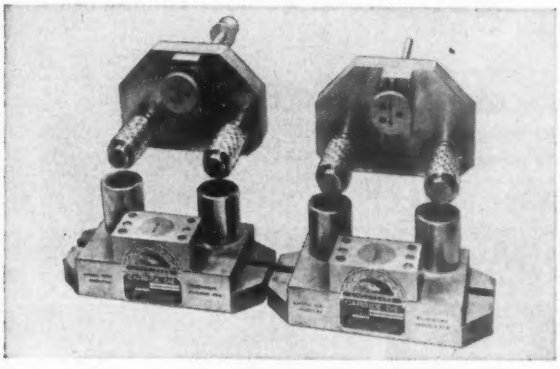


4 Piercing die, made for E.M.F. Dordt, Holland, was designed to pierce a small stator in 24 places. When dies have been wearproofed with cemented carbide, production increases, downtime decreases.

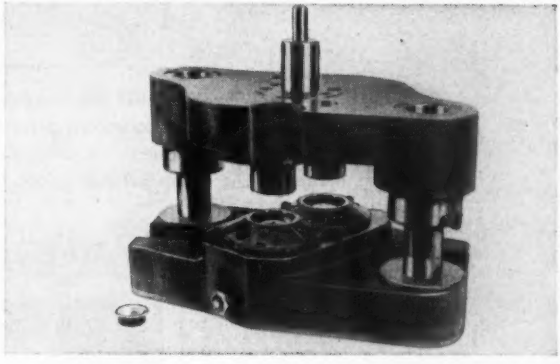
CIRCLE INFORM-A-GRAM KEY NO. 14

or whether they are complex

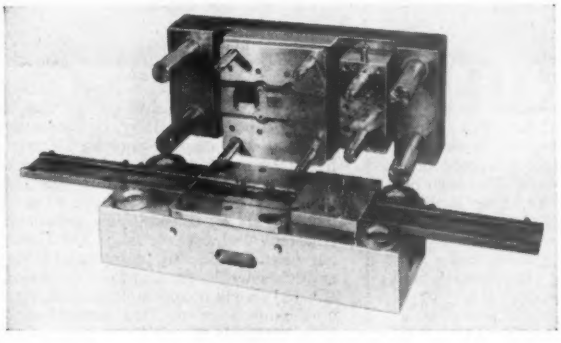
by equipping them with CARBOLOY®
CEMENTED CARBIDE



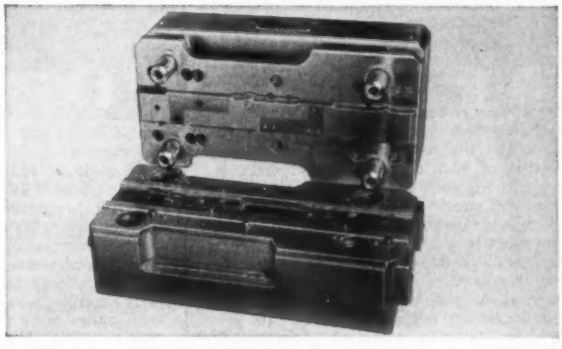
5 Single notching dies, also made for E.M.F. Dordt, Holland. Special design permits details to be interchanged on the same shoes to take full advantage of the carbide in short-run production.



6 Blanking and drawing of screw bottle caps is done by this die for Armstrong Cork Company, Lancaster, Pa. Die operated accurately on material .006" thick for months. Steel die had to be changed each week.



7 Lamination die made for Schick, Inc., produces rotor and stator laminations of motor-grade silicon steel. Customer reports carbide die produces average runs 35 times as long as steel dies.



8 Lamination die punches two, high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies time and again.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for the products of the Carboloy Department of General Electric Company

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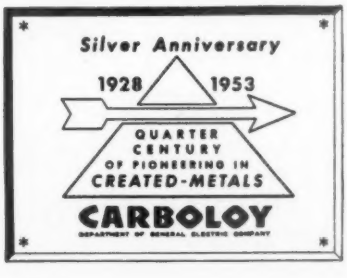

CARBOLOY Department of General Electric Company
11111 E. 8 Mile Street, Detroit 32, Michigan

- ☐ Rush me free Carboloy Die Engineering Manual D-124
- ☐ Send complete details on free Carboloy Training School
- ☐ Have a Carboloy Field Engineer call at my plant

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Company_____

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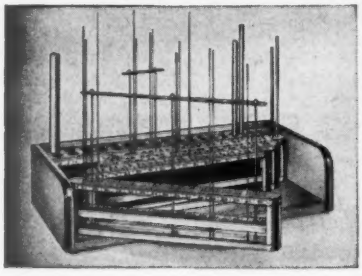
CIRCLE INFORM-A-GRAM KEY NO. 14

inexpensive

. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

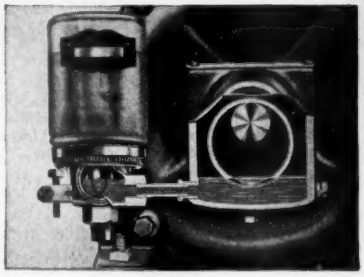


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

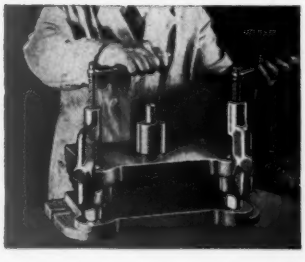
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS



The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-52.

ACRO

METAL STAMPING CO.

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CIRCLE INFORM-A-GRAM KEY NO. 16

Latrobe....
first again!
THIS TIME... IT'S
XL HIGH SPEED TOOL STEELS *
regular analysis high speed steels
...plus...
NEW SULPHIDE LUBRICANTS
...Additives made possible
by the "DESEGATIZED" process
now available in M-1, M-2 and M-10 types
Lower Costs through Higher Production
Contact your local Latrobe representative for further information.
*Patent applied for.
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STEEL COMPANY
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Tuesday, October 21, 1952 THE MIAMI HERALD 21-A

Financial News

Winn & Lovett's Earnings On Rise

By United Press

JACKSONVILLE—Winn & Lovett Grocery Co. reported for the quarter ended Sept. 20 sharply higher earnings, reflecting economies achieved through mechanization in warehousing and merchandise handling.

Net for the first quarter of the current fiscal year, totaled $600,597, or 44 cents a share on common, compared with $409,342 or 29 cents in the same quarter last year. Net sales of $41,851,672 compared with $36,763,499.

As of Sept. 20 the food chain had in operation 181 retail outlets [illegible] in Florida.

How To Make More Money

THIS NEWS CLIPPING suggests one way to make more money. Winn & Lovett's "sharply higher earnings" prove that a dollar saved is *still* a dollar earned.

"Mechanization" saved more than 50% of Winn & Lovett's handling bill. "Mechanization" in this case means a fleet of CLARK fork trucks and towing tractors, operated on a well-planned schedule. These savings, together with increased retail volume and retail operating improvements, resulted in "sharply higher earnings," and the company made financial headlines.

The moral of this story is this:

Call in your local CLARK dealer to discuss ways to cut handling costs. That's what Winn & Lovett did, and look what happened!

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS FORK TRUCKS AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 162, MICHIGAN

Please send: ☐ Condensed Catalog ☐ Have representative call ☐ Driver Training Movie

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

CIRCLE INFORM-A-GRAM KEY NO. 18

Talk of the Month

THE AIRCRAFT INDUSTRY AND MACHINE TOOLS*

by W. L. Davis
Plant Eng'g Electrical Supv.
El Segundo Division.
DOUGLAS AIRCRAFT CO., INC.
El Segundo, California

THE FOLLOWING COMMENTS reflect the experience of only one segment of the aircraft industry. These comments may contribute towards a better understanding of the machine tool requirements of the aircraft industry since our experience has been quite extensive. The backlog of orders at this Navy plane-building plant approaches a billion dollars; and, in order to manufacture these planes the Navy and the Company have, in the past three years, increased the size of the plant by approximately 110%. The machine tool procurement program has increased investments in these items by approximately 400% during the same period. The machine tools were, and are, being procured not only for greater production capacity, but in anticipation of the ever changing requirements of modern high-performance aircraft.

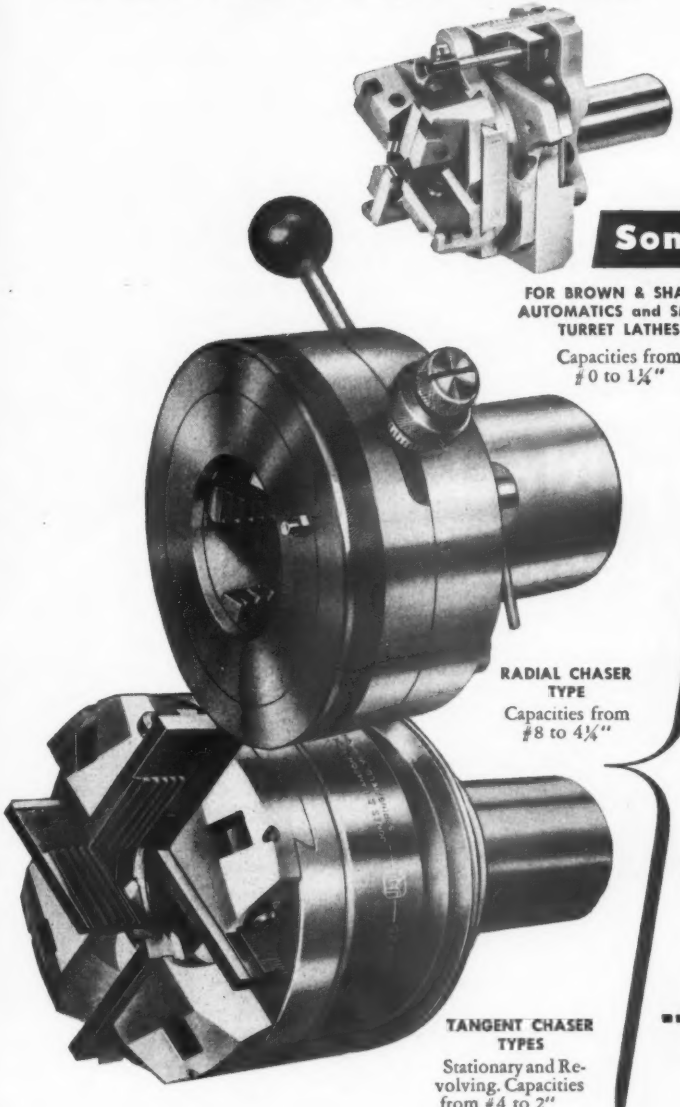
Machine tools sold for aircraft construction are essentially the same as those used in other industries. Our experience has shown that by making alterations to some standard machines certain tasks may be more easily accomplished. The purpose of this paper is to acquaint this group with operational requirements and other circumstances that dictate the field alterations to some equipment necessary to satisfy our particular needs. It is possible that other industries may benefit from our experiences by similarly adapting their machines or purchasing new ma-

. . . *Continued on page 22*

*From a paper delivered before the 1953 A.I.E.E. Conference on Machine Tools, and reprinted through courtesy of the American Institute of Electrical Engineers.

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

P.S. *Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

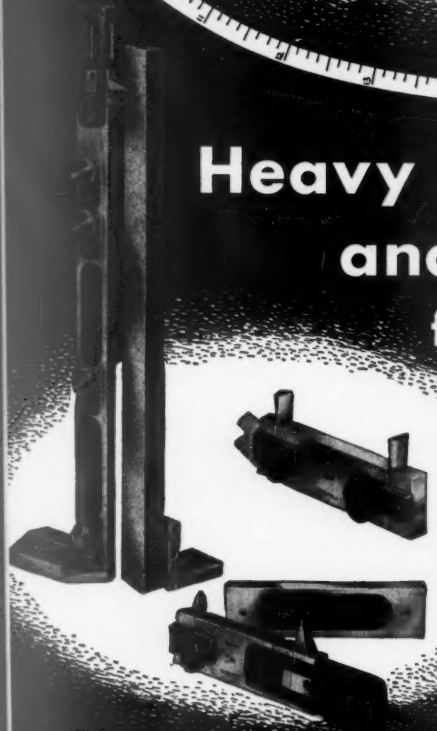
JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **DIE HEAD DIVISION**

CIRCLE INFORM-A-GRAM KEY NO. 19

Standard Webber Accessories
for Dimensions under 12"

WEBBER Standard Accessories are designed for use with standard Webber Gage Blocks and are recommended for measurement under 12". Gage block holders, jaws, center point, scriber and base can be combined into a variety of small gages for precision layout and inspection.

Heavy Duty Blocks and Accessories
for Dimensions over 12"



No workpiece too large, infinite range. Patented clamps, jaws, center point, scriber and base offer wide gaging application. Patented eccentric clamp squeezes blocks in opposite directions thus maintaining ± .000005" over entire buildup.

Webber
GAGE BLOCKS and ACCESSORIES

THE WEBBER GAGE COMPANY
12903 Triskett Road • Cleveland 11, Ohio

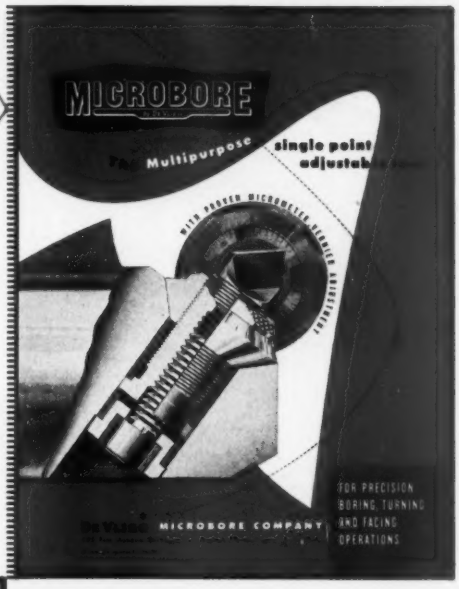
Largest exclusive manufacturer of precision gage blocks

DEVLIEG OF DETROIT

brings you a new comprehensive catalog featuring—

Microbore

...the multipurpose single point adjustable tool for precision boring, turning and facing operations.

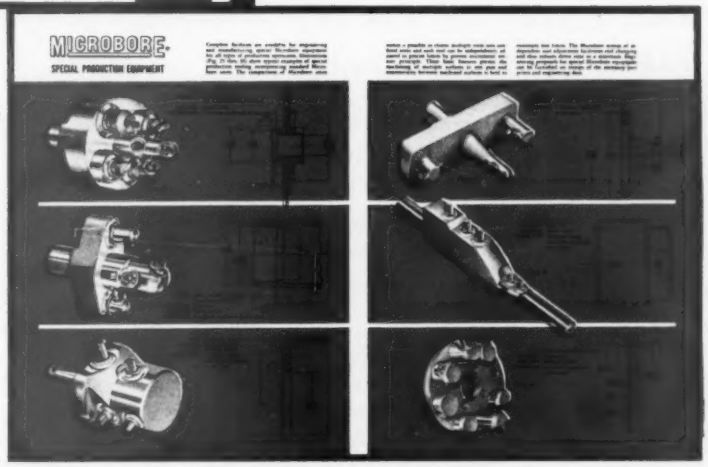


For General Purpose Work:

A wide range of standard Microbore boring bar sets is available for tool work and general purpose boring.

For Production Applications:

A complete service is available for engineering and manufacturing special Microbore equipment for all types of production operations.



A request on your company letterhead will bring a free copy of this catalog.

DEVLIEG MICROBORE CO. 480 Fair Avenue, Ferndale · Detroit 20, Mich.

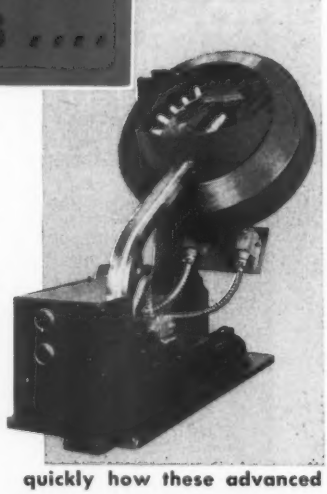
CIRCLE INFORM-A-GRAM KEY NO. 21

PRODUCTION *Pacemakers in* MODERN INDUSTRY

DPS SCREWDRIVERS *and Motorized* HOPPERS

PROVIDE ASSEMBLY SPEED THAT CLEARS THE WAY FOR FASTER, UNINTERRUPTED OUTPUT

• Your production program need not be retarded by outmoded assembly methods . . . Substitute slow, manual handling with speedy, mechanical action . . . Use DPS modern power-driven equipment . . . Benefit by the advantages of lower labor costs, on-time deliveries greater profits . . . Detroit Power Screwdrivers and Motorized Hoppers have brought about a new era in the feeding and assembly field. Find out quickly how these advanced machines can be adapted to your requirements . . . Send samples now for detailed information.



DETROIT POWER SCREWDRIVER CO.

[illegible] W. FORT ST. DETROIT 16, [illegible]

CIRCLE INFORM-A-GRAM KEY NO. 22

. . . Month's Talk, from page 18

chines incorporating features developed for the aircraft industry.

Basic Suggestions

Three basic suggestions are: 1. That all machine tool wiring comply with the most rigid state electrical code. 2. That only National Electrical Manufacturers Association equipment be used, and 3. That the Joint Industry Code Standards be adhered to.

Most large aircraft manufacturers perform as prime contractors. In this role they are committed to furnish machine tools to their subcontractors and vendors. Most subcontractors are usually within a 750-mile radius of prime contractor's operations, while some are located in adjoining states. Inasmuch as tools are sent into distant areas to large and small subcontractors, and, where there is a high labor turnover, it is essential that these tools be as trouble-free as possible. Maintenance-free machines are only a dream, but we would like to mention the following specific items to minimize trouble calls.

Specific Suggestions

1. Form and lace all wiring in control enclosures to avoid excessive bulk and permit more rapid tracing and checking when trouble occurs.

2. Install reversing magnetic starters, where required, for all except fractional horsepower motors.

3. On fractional horsepower motors use a drum switch for reversing control if desired, but interrupt the motor load by a magnetic starter and not the drum switch. Some operators prefer the feel and physical action of drum switches; however, maintenance records indicate unsatisfactory life when the full motor current is broken.

4. Electrically interlock the push buttons for reversing and multi-speed starters.

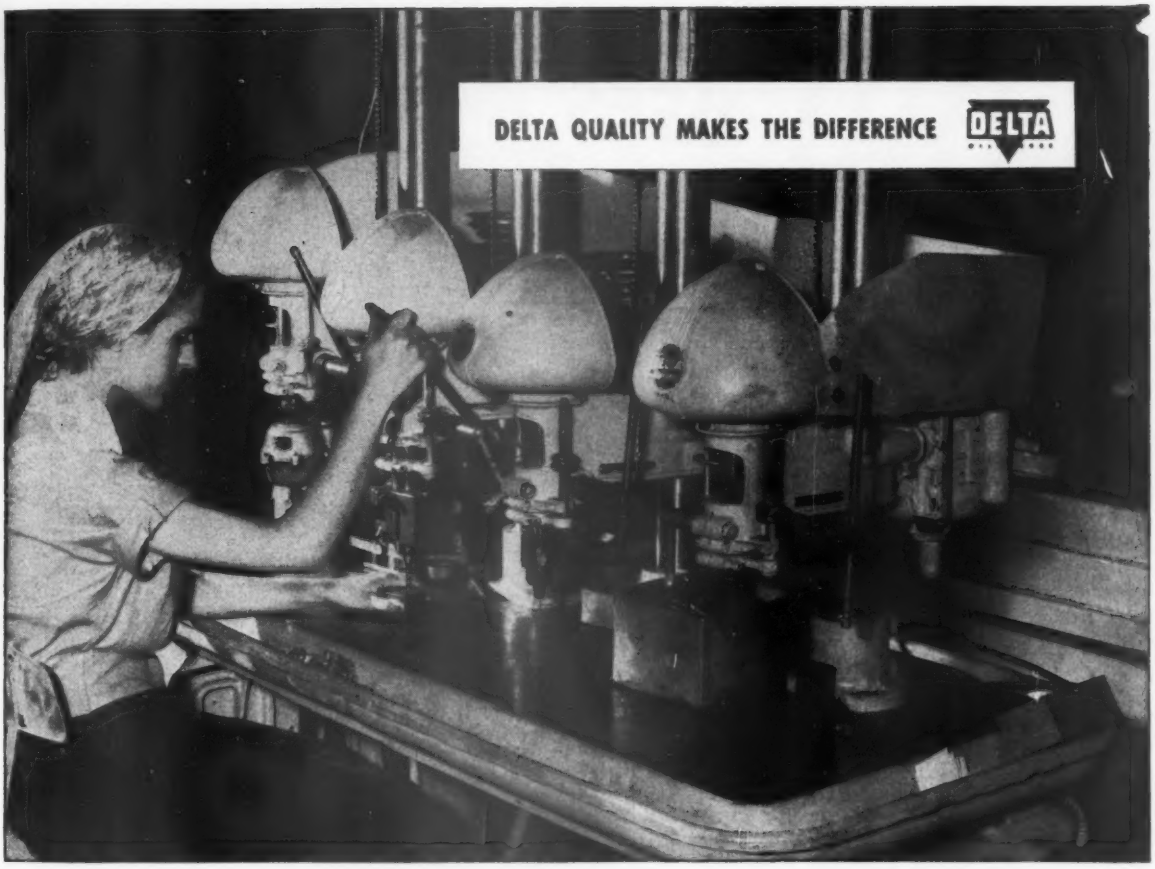
5. Consolidate controlling equipment in a common enclosure whenever possible.

6. Eliminate splices and use of equipment lugs for multi-wire connections by incorporating adequate terminal blocks.

7. Leads to movable parts should be extra-flexible wire.

8. Flexible conduits should be made mechanically and electri-

. . . Continued on page 27



One Operator Plus One **DELTA** Set-Up

HOLLOW MILLS, DRILLS, TAPS AND COUNTERSINKS

AT SKILLMAN HARDWARE

More pieces per hour with less labor cost—that's what Skillman Hardware Manufacturing Co., Trenton, N. J., gets by locating inexpensive Delta tools in groups so that related machining operations can be done by a single operator.

Though Delta tools are inexpensive, they are production machine tools—as accurate as tools costing many times as much.

Here's the testimony of John Strasenburgh, Skillman production foreman: "Of course, since we build locks, our precision standards are very high, and we work as close as .0005", but our Delta tools are accurate, dependable and easy to operate."

These are some of the ways Skillman groups Delta tools:

- . . . two Delta drill presses side by side; one drills, the other taps.
- . . . three Delta drill presses together to drill, tap and counter sink.
- . . . four Delta drill presses—to hollow mill, drill, tap and counter sink.
- . . . two 17" Delta drill presses mounted on single column with opposing spindles drilling and reaming same hole in one set-up.

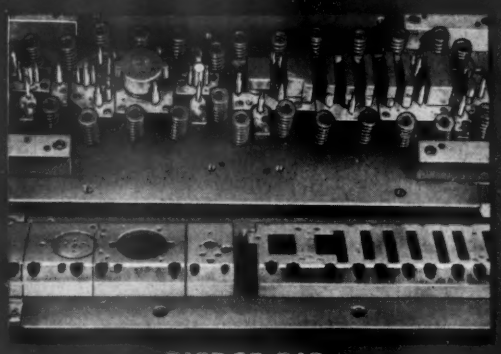
Light, mobile, dependable Delta tools are easily adapted to hundreds of production jobs. There's a wealth of such performance data available to you. Ask your Delta dealer—he's in your Classified Phone Book under "Tools," "Machinery" or write for Catalog AB52 to Delta Power Tool Division, Rockwell Manufacturing Co., 622M N. Lexington Ave., Pittsburgh 8, Pa.

DELTA quality power tools

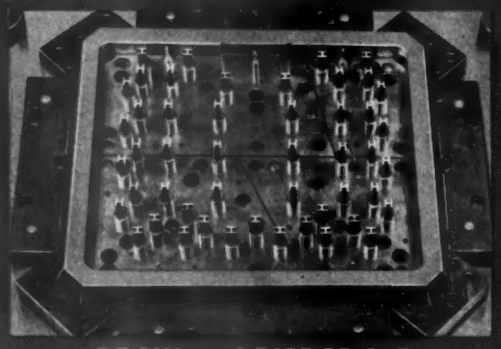
Another Product of **Rockwell**

CIRCLE INFORM-A-GRAM KEY NO. 23

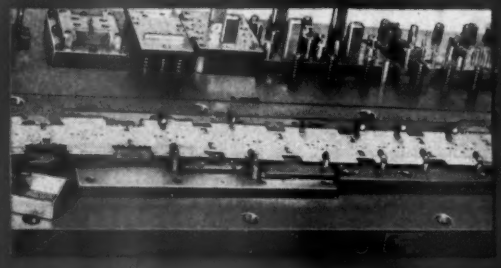
WHO USES R-B PUNCHES



PIERCE DIE



DRAW and PIERCE DIE



PROGRESSIVE DIE

Through many years of providing America's leading industries with interchangeable and standardized punches, die buttons and retainers, R-B has built a reputation for increasing production, lowering costs and saving time. R-B case histories of savings and benefits include users of cam actuated, multi-station progressive, forming, blanking, piercing, embossing and combination dies of all sizes and types.

Why don't you investigate the cost saving features of R-B equipment?

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 77 • 12635 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME_____ TITLE_____

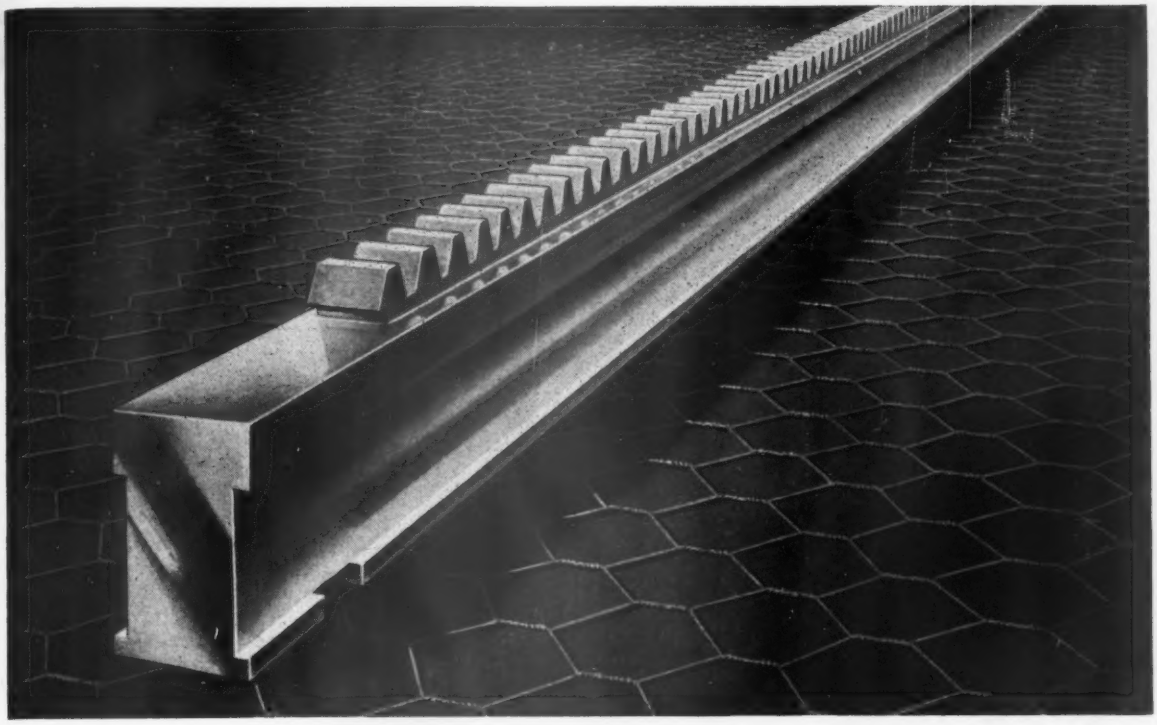
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES
MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 24



7-foot Graph-Mo® steel rack hardened without distortion

THIS long, slim gear rack, part of a new Wean Equipment Company hexagon netting machine, started out as a problem child.

With the first steels tried, case hardening caused extreme distortion. And the few racks that did harden straight enough to be useable did not wear well.

As soon as the manufacturer turned to Graph-Mo®, one of four graphitic steels developed by the Timken Company, the problem vanished. Because Graph-Mo responds uniformly to heat treatment, the racks hardened without distortion. Heat-treating scrap was completely eliminated.

In addition, the Graph-Mo racks gave exceptional wear. First, the free graphite in Graph-Mo's structure acts as a built-in lubricant—reduces friction between the rack and the gears it engages. Second, diamond-hard carbides in Graph-Mo give it great resistance to abrasion and wear.

On top of all this, there was a 30% saving in machining time—Graph-Mo being easier to machine than ordinary tool steels.

For helpful information on the use of Graph-Mo and other graphitic tool steels for machine parts, dies, punches and gages, write for the 10th edition of "Timken Graphitic Steel Data Book". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CIRCLE INFORM-A-GRAM KEY NO. 25

Miller AIR CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

BRASS BARRELS
Eliminate Rust and Corrosion

WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. PNEUMATI STANDARDS years befo their adoption in 1950.

SPACE-SAVING SQUA DESIGN originated by Mil in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

MILLER MOTOR COMPAN

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMUL COUNTERBALANCE CYLINDERS

. . . Month's Talk, from page 22

cally secure in all connectors with approved parts.

9. And last but not least, identify all wires on both ends by approved markers, even if wires connect to labeled terminals.

General Suggestions

Some suggestions of a general nature are as follows:

1. Arrange starter and control enclosures to spaciously accommodate other than one control manufacturer's equipment, so that each purchaser may use his preferred make of control thereby reducing his maintenance stock inventory.

2. Some plants are being planned on the "product method" of layout where numerous operations are performed on parts before progressing to succeeding departments. This reduces transportation time and expense of handling material by bringing together various machine operations; consequently, construct enclosures oil and dust tight, so that machines may be located any place in the plant without danger of contamination.

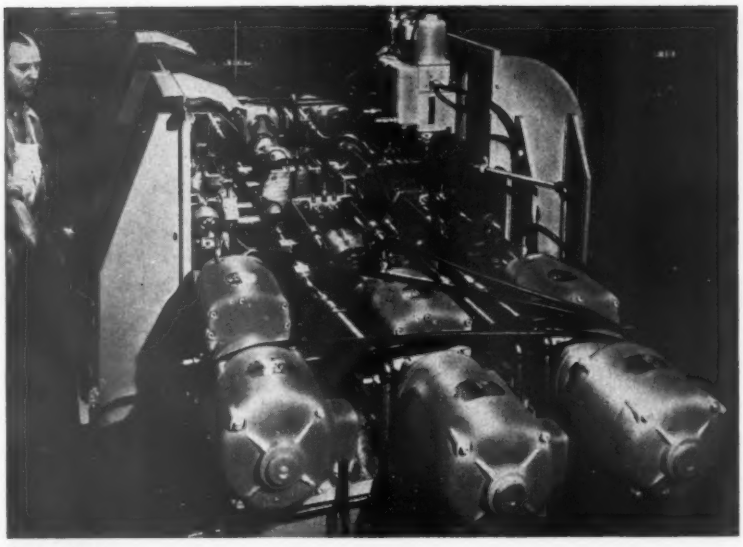
3. Capacity of control transformers should provide a minimum of 200 watts for supplemental lighting. This should be in excess of auxiliary equipment needs.

4. Supplemental lighting equipment should be tailored to the particular machine or type of work to be performed.

5. The machine should be self-contained with only one power service necessary. Aircraft design is rapidly changing which affects departmental work loads; that is, some expand, some contract, others are created or eliminated. At Douglas we say, "If you don't tour the plant daily you are likely to get lost." These departmental changes mean moving of equipment. The fewer services requiring attention the more rapidly the move is completed. The enigma of separate services for controls and auxiliaries will become more distressing as 480-volt wye power and lighting distribution finds greater application.

6. Reduce gear trains by the use of multi-speed or variable speed motors. This will assure that a greater percentage of the motor horsepower will be avail-

. . . Continued on page 102



Machine Details
Dimensions: 10¾' long, 6½' wide, 7' high; weight about 16,000 lbs. 8 Delta drill units: 6 Model 19-400; 2 Model 19-150. 5 drill units equipped with multiple-spindle drill heads. Total HP—13.

Control Panel
Selector switches make possible any combination of 3 positions, 8 stations—a universal machine. Operator presses a starting button; sequence of operations is automatic; machine stops automatically when work is finished. 3000 feet of wiring between panel and machine.

From 25 minutes to 2 minutes
-that's the time saved by A.B.DICK CO.
with 8 DELTA
AIR-POWERED
HYDRAULIC DRILL UNITS

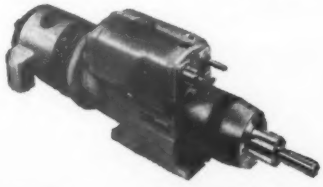
When conventional tools required 25 minutes to complete 9 holes in a spirit-duplicator cylinder, A. B. Dick engineers built their own special horizontal drilling machine, using 8 Delta air powered hydraulic drill units, and now do the job in less than two minutes.

Their new machine drills, spot faces and reams 9 holes in aluminum cylinders—needs but a single operator, has automatic remote control.

Operation of this 3-position, 8-station machine consists of loading and pressing the starting button. The Delta drill units operate in four banks, in automatically controlled sequence of drilling, spot facing, milling and reaming. When the cycle is completed, the finished piece returns to original position and the machine stops. It is universal—handles any piece up to 12" diameter and 24" length.

"This machine is so fast and so accurate," says Edward Brenn, design engineer, "that 3 or 4 days use per month is ample to keep up with production demand. The operator is free for other duties. We just didn't have the equipment to do this job economically—so we built the machine ourselves."

Three Delta air powered hydraulic drill unit models are now available to meet your specific requirements—1½", 4" or 6" stroke; No. 80 to 1" diameter drill. See your authorized Delta drill unit dealer—write for new catalog.



DELTA QUALITY MAKES THE DIFFERENCE

DELTA QUALITY MACHINE TOOLS
Another Product of Rockwell

Delta Drill Unit Division
Rockwell Manufacturing Company
622M N. Lexington Avenue,
[illegible] 8, Pa.

☐ Please send catalog AD-723.
☐ Send name of nearest authorized Delta drill unit dealer.

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

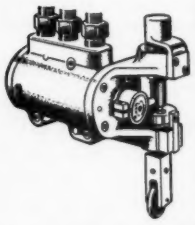
CIRCLE INFORM-A-GRAM KEY NO. 27

UNBRAKO SOCKET CAP SCREWS have knurled heads for sure grip, fast assembly; accurate hex sockets for positive, internal wrenching; fully formed threads, Class 3 fit.

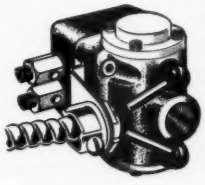
Made of heat treated alloy steel, with controlled fillet and continuous grain flow, for strength; available in standard sizes from #4 to 1" in a full range of lengths.

Our Fiftieth Year

A START FOR THE FUTURE



USE UNBRAKO SOCKET CAP SCREWS for compact designs to save space, weight and material on machine tools and metalworking equipment.



On electrical and electronic devices, textile machinery and automotive equipment.

On precision instruments, dies, jigs and fixtures, and many other applications too numerous to mention.

Do you really need a special UNBRAKO screw?

Before you specify a special socket screw, check UNBRAKO Standards. A standard UNBRAKO will do the job as well in most cases—and much cheaper. You'll get better service and faster deliveries, because UNBRAKO socket screw products are stocked by your industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 36, Pa.

Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 28

Increases production 25%

NEW ROTOR TOOLS "PAID OFF" IN 13 WEEKS

JOB—Large truck cabs had to have heavy welds blended for good appearance. Men objected to heavy 14-pound grinders. Incentive shop . . . needed more production to meet schedule. Grinders required constant maintenance.

SOLUTION—Put Rotor B-12 Verticals at 6000 RPM on trial to determine their metal removing qualities.

RESULTS—Time studies show increase of 25% in production. Savings "paid off" the new tools in 13 weeks, reduced operator fatigue, cut maintenance and sanding disc costs.

Ask for a demonstration of Rotor tools and figure the savings on *your* operations! Call for a trial. Catalog 40 describing the Rotor line of production boosters is yours for the asking.

ROTOR GRINDER FACTS

B-12 Vertical **5" Cup Wheels**
7" Sanding Pads
10 lbs. **7" Cut-Off Wheels**
4500-5000-6000 R.P.M.

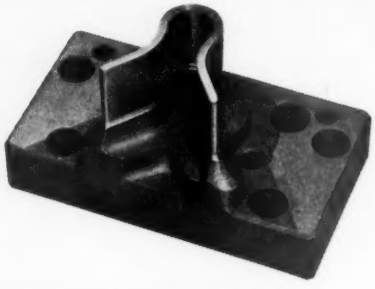
High speed under load—adjustable handles for comfort—built to "take it" on tough jobs.

CIRCLE INFORM-A-GRAM KEY NO. 29

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG GRINDERS

HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¾ hours.*



CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

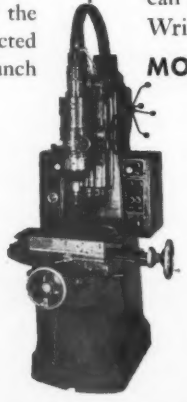
The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Ave., Bridgeport 7, Conn.



NO. 2 MOORE JIG GRINDER
Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up and down; spindle-housing heat control. Features slot grinding attachment.

ADD MOORE TOOLS TO YOUR TOOLROOM

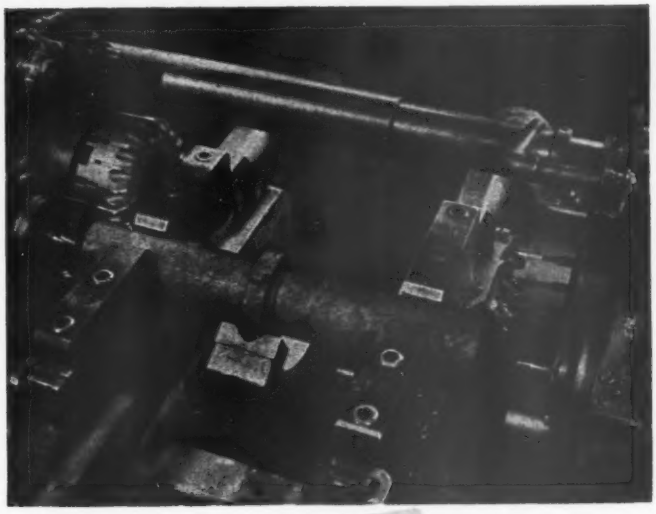
JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

CIRCLE INFORM-A-GRAM KEY NO. 30

WESSONMETAL

CORNERSTONE for METAL WORKING PRODUCTION



150% INCREASE IN OUTPUT PER DOLLAR SPENT FOR *WESSON TOOLING*

COMPLETE PRODUCTION STORY ON THE CATERPILLAR TRACK ROLLER SHAFT

Machine.....Fay automatic lathe
Part Machined...Track roller shaft
Operation.....Milling and centering
Material.....1046 steel
Tools.....6¾" dia. Wesson Rigidcut Milling Cutter—18 blades
Speed.....320 S.F.M.
Depth of Cut.....¼" to 7/16"
Feed.....15" per min.
Feed per Tooth..... .005"
Feed on Center Drill..... .006"
Production.....400 pcs. per grind: 50 pcs. per hour
Grade of Carbide..Wessonmetal WH

OLD METHOD	WESSON ENGINEERED METHOD
Pieces Per Grind.....166	Pieces Per Grind.....400
Tool Cost Per Piece...$0.0716	Tool Cost Per Piece..$0.0285
Grinding Hours Per Year.....420	Grinding Hours Per Year.....183.33

ON 1 JOB WITH 1 WESSON TOOL SAVINGS OF OVER $2400.00 PER YEAR

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY
Affiliated with WESSON COMPANY, Detroit, Mich.

WESSONMETAL Cemented Carbide

CIRCLE INFORM-A-GRAM KEY NO. 31

NEW!

AUTOMATIC power feed

...for all BENCHMASTER HAND-SCREW MILLS!

$125.00 F.O.B. FACTORY

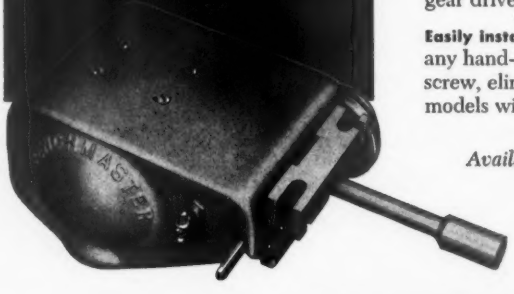
Complete, Ready to Install and Plug In

MOTOR: 1/15 hp, 110 V. AC 60 Cycle

MECHANISM: Bronze Gear, Steel Worm

WEIGHT: Approximately 10 lbs., Net

DIMENSIONS: 4½" x 5½" x 8", less connecting shaft.



Four speeds in either direction! 1.2, 2.1, 3.2, and 4.5 inches of table travel per minute...all independent of spindle speed and direction of rotation.

Powerful! Table drive equals or exceeds milling capacity of the spindle.

Table travel instantly reversible! Reversible motor and simple two-way switch instantly reverses direction of table feed. Adjustable stops limit table travel in either direction.

Doesn't interfere with manual operation! Lever quickly disengages worm gear drive, permitting use of ordinary hand feeds when desired!

Easily installed in 10-15 minutes! Two bolts secure unit to end of table on any hand-screw model. Slots in adapter permit easy alignment with lead screw, eliminate fussy hole location. (Note—not adaptable to production models with rack and pinion table feed.)

Available factory-installed on all new Benchmaster Mills, or as an accessory for all Benchmasters now in use! See your Benchmaster dealer today!

Benchmaster Manufacturing Company
1835 W. Rosecrans Avenue
Gardena, California

benchmaster

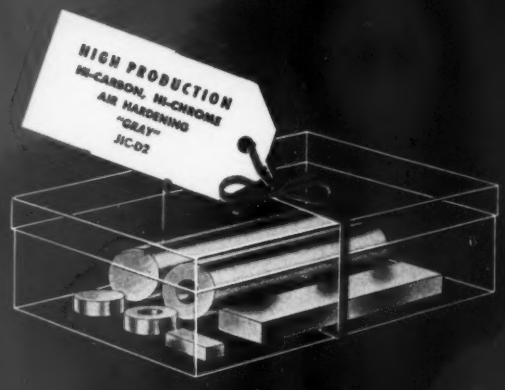
World's largest manufacturer of small punch presses and mills.

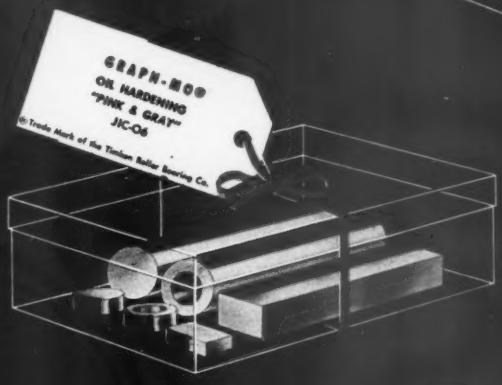
CIRCLE INFORM-A-GRAM KEY NO. 32

MILNE

HOLLOW & SOLID

TOOL STEELS . . .





. . . are unforgettably "Gift Wrapped*"

Insulated Against Confusion by Full Length Identifying Kolorkote and Heat Treatment Card of Matching Color

It's just about impossible to lose, confuse or abuse a piece of Milne's Tool Steel. It's completely "gift-wrapped" . . . spray painted in permanent color that instantly identifies the grade. With every shipment goes a heat treatment card of a color that matches the steel.

You eliminate costly errors, delays, confusion and phone calls. Inventory control, scrap identification and stock movements are simplified.

You know what you have . . . how to treat it . . . as long as you have it.

Hollow Die Steels Have Been a Milne Specialty Since 1916. Sizes 16" OD x 12" ID to 2" OD x 1" ID Rough Turned, Smooth Bored.

Write for Milne's New Hollow Die Catalog which includes a section on the new cost-cutting Graphitic Hollow Die Steel.

WAREHOUSES
NEW YORK
CHICAGO
BOSTON
NEW BRITAIN, CONN.
PHILADELPHIA
PITTSBURGH
CLEVELAND
DAYTON
SAN FRANCISCO
ATLANTA

SALES OFFICES
DETROIT
ROCHESTER
ST. LOUIS
BRIDGEPORT
LOUISVILLE
WORCESTER
MILWAUKEE
SEATTLE

SALES AGENTS
TAYLOR-SPOTSWOOD OF CALIF.
LOS ANGELES

PACIFIC MACHINERY & TOOL STEEL CO.
PORTLAND, OREGON

D. A. JACKSON, INC.
SALT LAKE CITY

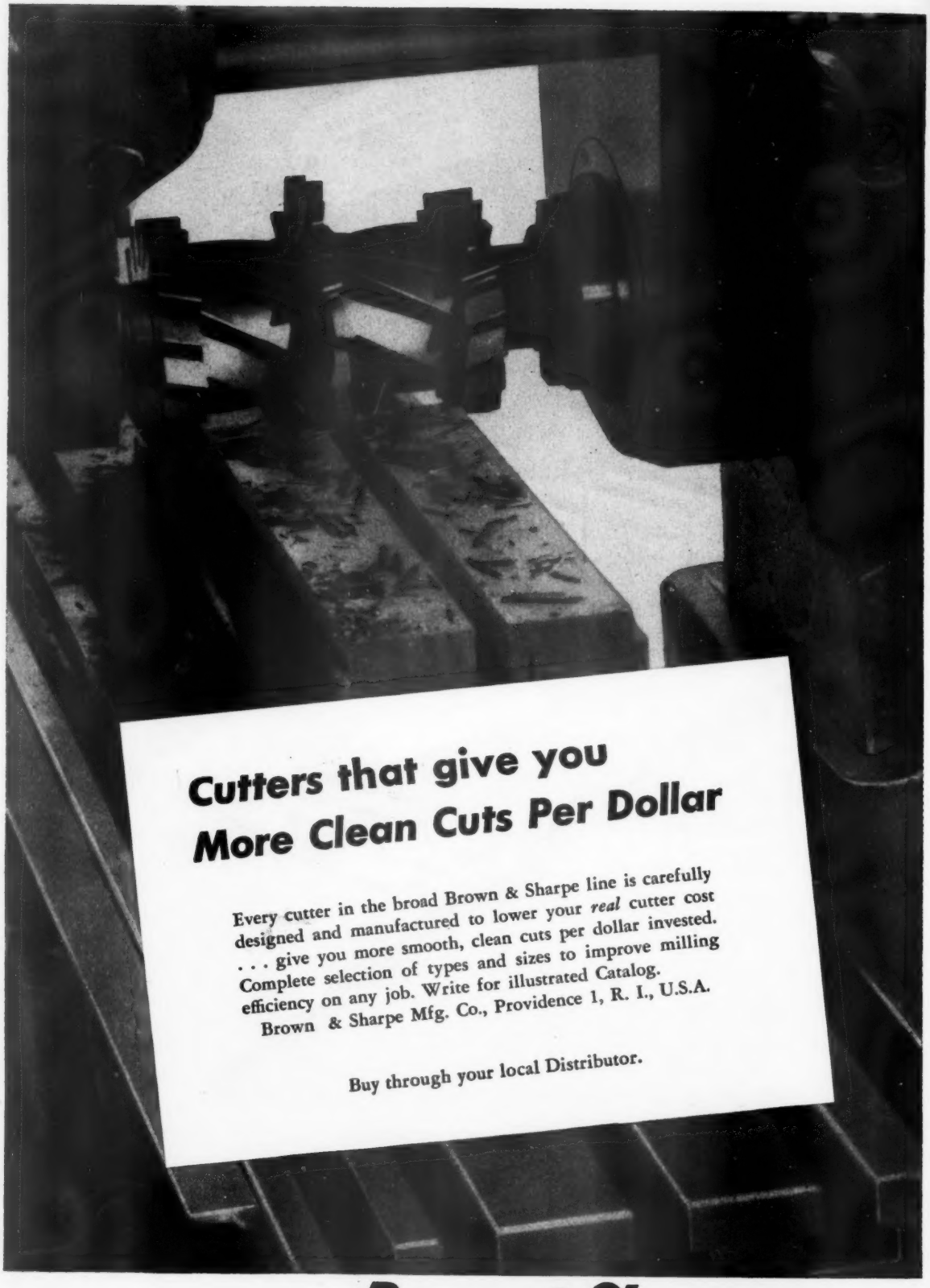
GEOFFROY-LANE, INC.
DENVER

SANDERSON-NEWBOLD, LTD.
MONTREAL-TORONTO

E. MILNE & CO.
745 WASHINGTON ST. NEW YORK 14 N Y

Complete line of tool steels . . . Wide range of grades and sizes.

CIRCLE INFORM-A-GRAM KEY NO. 33

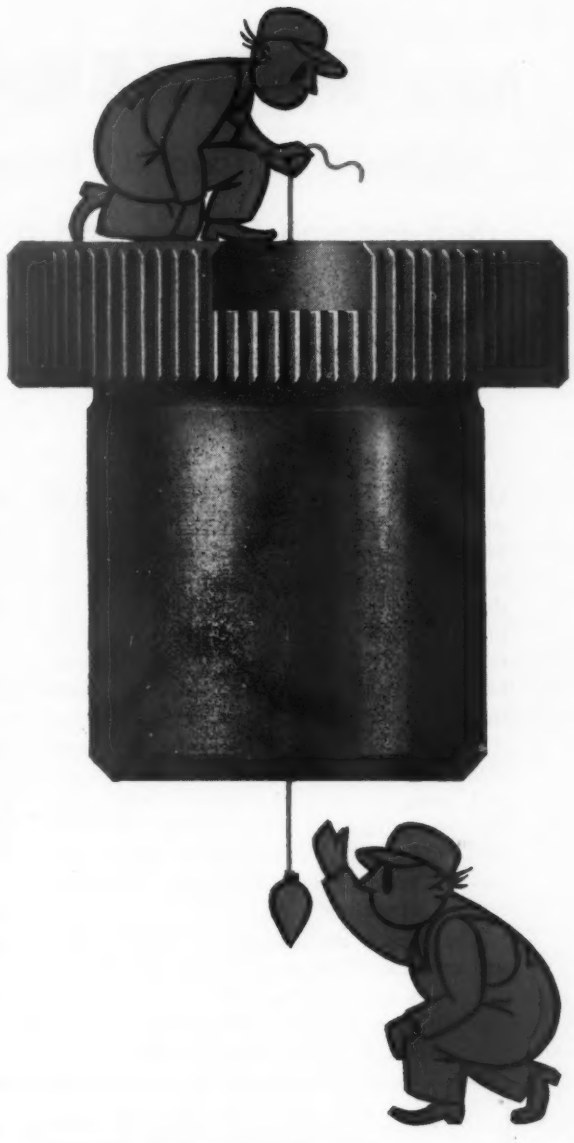

Cutters that give you
More Clean Cuts Per Dollar
Every cutter in the broad Brown & Sharpe line is carefully designed and manufactured to lower your *real* cutter cost . . . give you more smooth, clean cuts per dollar invested. Complete selection of types and sizes to improve milling efficiency on any job. Write for illustrated Catalog.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.
Buy through your local Distributor.
Brown & Sharpe
B·S

CIRCLE INFORM-A-GRAM KEY NO. 34

FOR PERFECT ALIGNMENT...

UNIVERSAL
DRILL BUSHINGS

Universal Drill Bushings help increase efficiency and simplify jig drilling operations by insuring perfect alignment of drills. Blended radius on the top inside diameter guides the drill into place and helps prevent tool hang-up and breakage. Superhoned bores keep tool wear to a minimum, especially in close tolerance work. 100% concentricity and hardness tests insure accuracy and uniform high quality. Knurled heads provide a quick, sure grip. Made in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.



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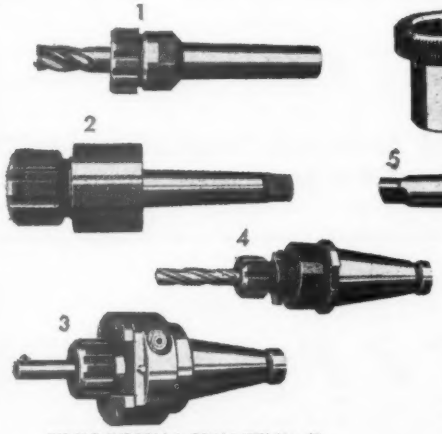
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY No. 35

PARKER-KALON®

originator and world's largest producer of hardened Self-tapping Screws, and a leading manufacturer of Socket Screws and other fasteners, is now a Division of General American Transportation Corporation

GENERAL AMERICAN, with principal offices in Chicago, owns and operates the nation's largest private fleet of freight cars which are leased to many of the foremost industrial companies, and to railroads. In addition, it is a major builder of all types of freight cars, owns and operates tank storage facilities, and is engaged in the manufacture of process equipment and molded plastics.

In pursuance of a program of diversification, General American has acquired the business and assets of the Parker-Kalon Corporation through the purchase of capital stock. The business will henceforth be operated as the Parker-Kalon Division of General American Transportation Corporation.

The present management of Parker-Kalon will continue in charge. The sales and service policies which have won the approval of the many thousands of P-K customers will remain in effect. As always, P-K Fasteners will be sold through P-K Distributors in every industrial area in the United States, Canada and in many foreign countries.

With the far greater resources available through its new ownership, Parker-Kalon will accelerate a program of improvement and expansion. New production and warehouse facilities will be built to meet the constantly increasing demands for P-K fasteners. Engineering and research will be augmented to speed the perfection of new P-K products now in development.

Now, even more than before, you can rely on Parker-Kalon for leadership in fastener design, for consistently high fastener quality, and service in step with your needs.

P-K TRADE MARK REG. U.S. PAT. OFF.

PARKER-KALON®

Division

General American Transportation Corporation
200 Varick Street, New York 14, N. Y.

GENERAL AMERICAN

CIRCLE INFORM-A-GRAM KEY NO. 36

editorial

to you . . . our thanks and appreciation

"Tooling up" this page for our December editorial has posed a bit of a problem.

What we want to do is to express our appreciation to literally thousands of good people who have, in many ways, expressed their enthusiastic approval of our 1953 efforts.

The dilemma is how to do this and, at the same time, not appear to be blowing our own horn. Obviously, it can't be done, so why fight it? If this be horn blowing, you, to a great extent, have given us the tune to play.

With this December issue, *TOOLING and PRODUCTION* makes its twelfth appearance in its new and enlarged size. We were confident that our readers would welcome the enhanced readability due to the larger type, the expanded photographs and drawings, and "opening up" of pages, all made possible by the larger areas we have had to work with. But we certainly did not anticipate that so many of you, readers and advertisers alike, would take valuable "time out" to express your kind endorsement of our program.

Our editorial features have enjoyed extremely gratifying reader acceptance. Our best yardstick for judging this is the all time high in your requests for reprints, tear sheets and extra copies of complete issues.

This is very, very gratifying and, best of all, much of the credit for it is due to the caliber of our authors.

The prestige of these men in industry, their willingness to share their hard-earned know-how, their recognition of *TOOLING and PRODUCTION* as a static-free communications network for reaching you, the designers, builders and users of production tooling, is your insurance that *TOOLING and PRODUCTION* reading time is well spent and is our insurance of high editorial standing in industry.

We are referring to such faithfuls as Lester Spencer, New England's famed metallurgist-writer; E. J. (Cut and Carry) Urbas, Superintendent, Tool and Die Department, The Guarantee Specialty Manufacturing Company; Roscoe Smith, who heads up the widespread quality control operations of the Ford Motor Company; Herbert Chase, the cross-country dean of industrial writers; and Joseph Manuele, Director, Headquarters Quality Control Department, Westinghouse Electric Corporation. The fact that our October QUALITY CONTROL Feature Issues are referred to by the boys at Westinghouse as "Manuele's Annual" (he hasn't missed in four years) is a distinction we are happy to share.

There is another important phase of our 1953 activities that deserves mention. That is the tangible evidence of the value of our editorial and advertising services. The editorial descriptions of new products, the mentions of new literature, plus the "pulling power" of our advertisers' display pages, have occasioned an unprecedented volume of requests from you for additional information.

Our new size, more prominent page layout and increased circulation all contribute to this growth. Knowing that 1954 is going to call for hard-hitting sales effort and thorough follow-up of prospective business, it is most encouraging when our advertisers volunteer that *TOOLING and PRODUCTION* inquiries are of excellent and higher-than-average quality. That's you.

The mechanics of collecting, sorting and relaying your Inform-A-Gram inquiries, to the tune of well over 100,000 per year, is no spare time proposition. We have "retooled" the procedures in order to get the information back to you in the shortest possible time. You can rest assured that the phenomenal growth of our "inquiry department" has impressed one and all with the importance of the service rendered.

As the first of the holidays approaches we realize how much we have to be thankful for due to your support. Please accept this horn blowing recital of 1953's twelve months as our definite commitment to give you a still more valuable, stimulating and serviceable *TOOLING and PRODUCTION* throughout 1954's twelve months.

Most important of all, we sincerely wish each and every one of you a joyful holiday season projected into a prosperous 1954.

E. Willard Pennington

editor

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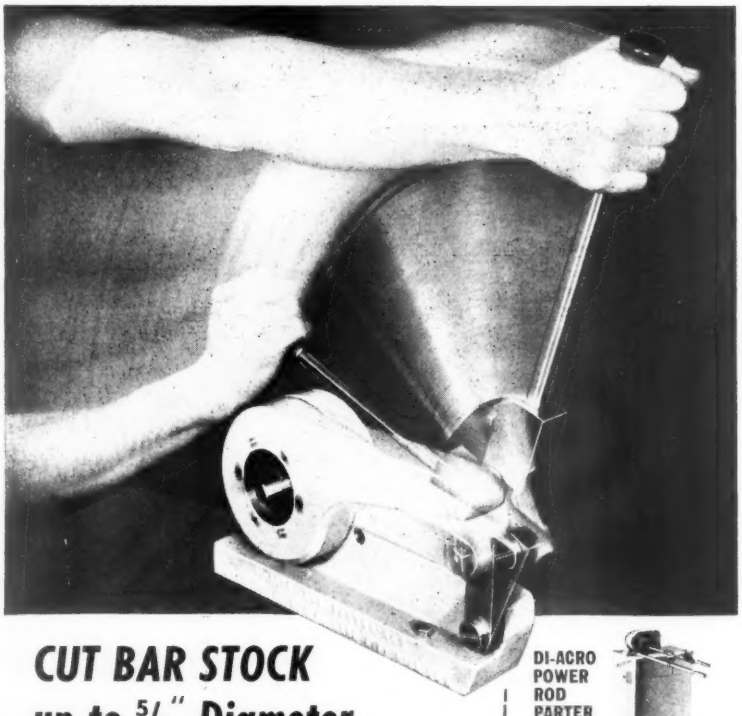

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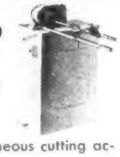

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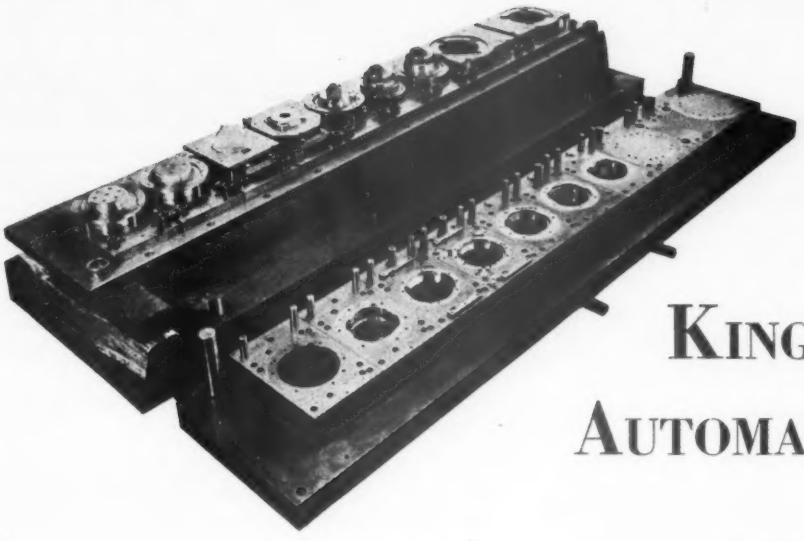


KING SIZE AUTOMATIC DIES

by Ernest J. Urbas
Superintendent, Tool and Die Dept.
THE GUARANTEE SPECIALTY MFG. CO.
Cleveland, Ohio

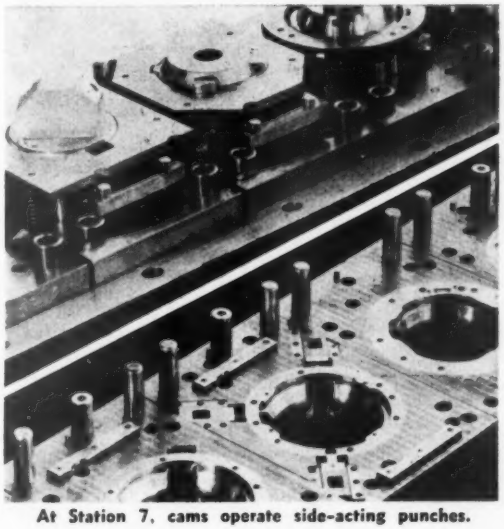
A CHALLENGING EXAMPLE is being set in the production of large stampings produced in mammoth dieing presses at the Monroe, Michigan plant of the Ford Motor Company. Recognizing the economical advantages of the tremendous potential output from automatic progressive dies, Ford engineers have adapted the tried and proven principles of small automatic die construction and applied them in the design of king size dies.

The accompanying illustration of the sample operations-strip (on next page) is indicative of the type of deep-drawn parts now being produced on such dies. Operating three shifts with an operator and a helper on each shift, six men produce more than 21 men formerly did on conventional presses. The king size die built for this part is a model of simplicity conquering the mysteries of metal's behavior as it is being cut, drawn, punched and mauled again and again and yet advancing thru the die in a synchrony of motion.

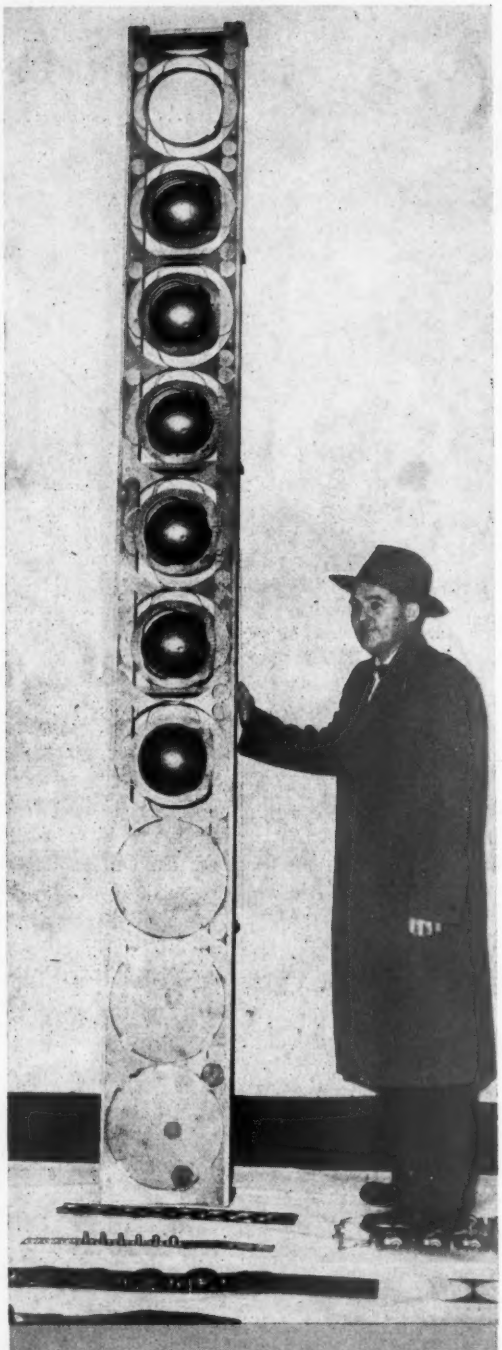
This 10-station die is 150″ long and accommodates a strip of material 13″ wide. Station 1 of the die pierces two small holes in the scrap area of the strip; and also cuts the first blank of the cutout pattern (See T & P, Dec. '52). The cutout style used here is the double round punch with four reliefs, which provides four connectors to the part and to the scrap. This is referred to as the four-leaf clover pattern.

At Station 2, there are three large holes punched to permit the entrance of cam punches in the seventh station. Also in this second station, two pilots enter the two small holes previously pierced in the strip. This piloting assures constant and precise pitch distance in starting a strip thru the die; however, once a cup is drawn, the cup is thereafter used as the pilot. In Station 3, the second round cutout blank is cut.

In Station 4, the cup is drawn to over 4″ deep. The drawing pressure pad presses only



At Station 7, cams operate side-acting punches.



The die that handles this strip is more than man size; it's king size. Double round cutout or four-leaf clover pattern provides for cut and carry of the blank, a characteristic of progressive drawing dies.

in the area of the double round cutout. To prevent any wrinkling as the cup is being drawn, a double-tandem air cushion is used to apply terrific pressure on the pressure pad.

In Station 5, additional shape is imparted to the cup. A smaller air cushion is used to apply pressure. Station 6 pierces and embosses the bottom of the cup. A rubber bumper cushion is used to apply force to shape the emboss.

In Station 7, cam operated punches traveling on a horizontal plane pierce the side holes, while punches traveling vertically punch other holes. In Station 8, a cam-operated punch traveling at a 45° angle pierces a hole in the side of the spherical-shaped cup. In Station 9, further shaping of the part takes place. Common springs are used here as the drawing action is not severe. Station 10 pinch-trim blanks the completed part from the strip.

The completed part drops thru the die to an inclined chute at the end of the press and onto a conveyor, which carries it up to a working height for the helper who stacks these well nested parts for convenience in finishing operations.

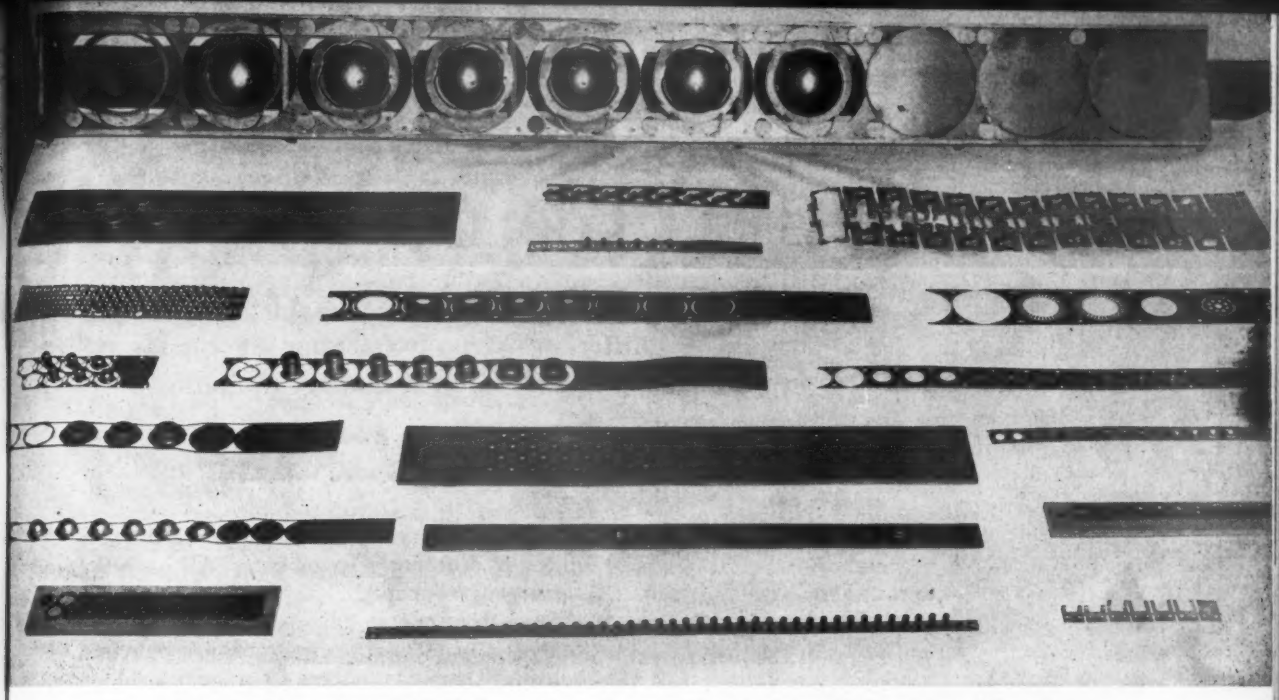
The king size automatic dieing press used to operate this king size automatic die is a Brandes 350-ton, double crank machine. The press shown with the die set in it clearly illustrates the simplicity of applying pressure mediums, an inherent feature on a dieing machine. All three pressure mediums—air, rubber, and springs—are advantageously employed to insure successful operation. To facilitate the removal of scrap or slugs, an extra chute has been provided in the center of the press frame. The press is equipped with automatic roll feeds, variable speed drives, and scrap cutter.

Expensive dies and equipment of this type are protected from damage by the use of Micro switches, which are tripped by disappearing pilots in the event of a misfeed. Whenever the Micro switch is tripped, the automatic press will instantly stop. "Instant stop" means the press will stop dead at the precise moment the Micro switch is tripped.

Once the die is set up in the press, its complete removal from the press is not necessitated every time there is a station failure. This is because each station is built to be removed individually from the press with the utmost convenience.

Other noteworthy features of this die, which are worth a second look, are the stop blocks between the guide posts of the individual die sets. These are placed intermittently thru-out the die to insure a balancing effect whenever a strip is started in the die.

Note the holes drilled in the individual die sets; they have been jig drilled. Foresight in



This operations-strip grouping indicates the wide range of work performed in progressive dies on presses of the type shown below.

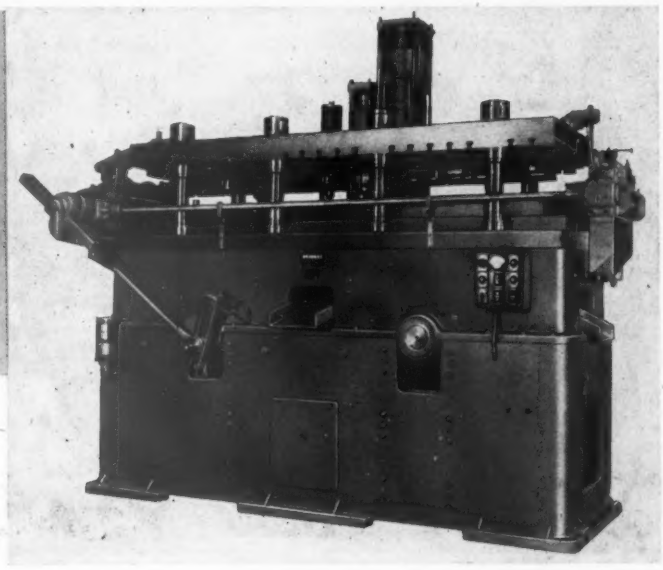
jig drilling each station can save considerable expense in the event of a design change.

If individual die sets are fully interchangeable, in respect to their mounting on the master die set, tooling at a particular station can be removed, replaced, or moved in either direction to be interchanged with the tooling at another station . . . all with very minimum downtime. Spare die sets for each station may be kept ready to substitute for those in use, should accident and die damage occur.

Note, too, the limited amount of tool steel used in each station in both the punches and dies. Note the holes that flank each die station; these are to accommodate combination stock guides and lifters which are used to raise the strip high enough to permit smooth uninterrupted feeding motion (See T&P, Aug. '53).

Those of us who have pioneered in the automatic die field and envisioned the potential advantage of king size dies in automatic presses, have reason to be proud, for indeed the automatic die fathered automation in the production of metal stampings.

The king size 350-ton Brandes press, used by Ford Motor Company in automatic production of relatively large drawn stampings as described in this article, provides unusual rigidity, precision alignment of tooling members, and greater ease in die-setting and maintenance.



OPERATIONS EXPEDITED BY VERSATILE TOOLING

At IBM, one die with nine removable punches makes 15 different parts. Stacking of blanks facilitates magazine feed on secondary operations.

by Herbert Chase
Forest Hills, New York

BLANKING, forming, and supplemental operations on parts for electric typewriters are basic and important considerations in the Poughkeepsie, N. Y. plant of International Business Machines Corporation. Such work is not permitted to become routine. There is constant effort to improve and to expedite production while continuing to meet the exacting specifications essential to hold the high quality standards set for all IBM products.

Comparatively few parts are required in really large volume. As there are a large number of different parts, however, operations more or less parallel those in job shops where runs are short and tooling changes are frequent. Nevertheless, some progressive dies are employed and some dies are so made that they can produce several parts that are similar but include important detail differences.

One that fits in both categories is shown in Figure 1. It is used with strip stock that is automatically indexed through five stations where piercing is done and finally reaches a sixth station where the piece, called a "selector bar", is blanked out. Actually, this die produces 15 different selector bars. All have the same general shape but different piercing. To change from one specific design to any of the others, it is necessary only to change punches, selecting them by numbers from the box shown at upper left in Figure 1 and locking them in the retaining hole indicated by the chart in the box cover.

With this die, the advantage of rapid production characteristic of the progressive die is obtained but die cost is spread over 15 different parts, each of which is produced at the same high speed of about 50 pieces a minute. Before this die was developed, the basic part was blanked in one die and then a given number of blanks was fed through each of 15 different dies that did the piercing. This involved much handling and setup work and hand feed of the blanked parts; hence, produc-

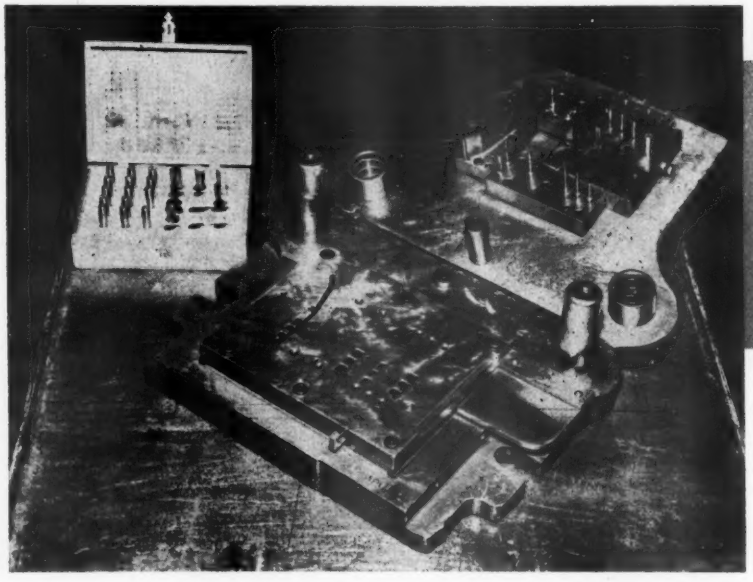


Fig. 1. This single progressive die, provided with a set of interchangeable punches in the box at upper left, produces 15 different stampings that have the same blanked contour but different piercing, and replaces 15 separate dies formerly used.

tion was much slower than with the progressive die now used.

Many other typewriter parts are blanked and pierced, often at quite a high rate, some in setups with automatic press feed. In nearly all cases, however, one or more secondary operations are needed on these parts and they have to be fed through dies that do extra piercing or forming or through machines that roll-straighten, burr or chamfer pierced holes, counterbore, or perform other operations.

Formerly, such parts were merely allowed to drop from the blanking dies into tote boxes in which they were shifted to the secondary operations. This meant that each part had to be picked up individually and placed by hand in the secondary die or machine. Today, nearly all such blanked parts are caught and stacked. These stacks are placed either in tote boxes, as in Figure 2, or in portable magazines that fit the stacks and can be placed in the next machine to feed the parts. In either case, the stacks, generally built up in chutes leading from the blanking dies, are ready for rapid feed in the next operation.

There, the operator picks up a convenient number of stacked parts at a time and loads them into the magazine from which they feed as rapidly as the operation permits. Each stacked part is located in the same position relative to the next one, and faster feeding is possible. Usually some simple device wipes each piece off the bottom of the stack and transfers it automatically and rapidly into working position in the die or machine.

Figure 3 shows an operator filling a magazine with stacked parts that are fed by a transfer slide into a die in a Niagara press. This method of loading is automatic and fast; and, since an air ejector is used, the operator keeps his hands well away from the die, thus promoting safety. Positive location, in some cases, is effected by taper pins.

When, as in many blanked and pierced parts, the edges of holes must be deburred or chamfered on one or both sides of the blank, a setup such as that shown in Figures 4 and 5 for cam levers is employed and does an excellent as well as a very fast job. In this case use is made of two Delta drill presses, one supported on a column above a work table and one below the table in inverted position. Perpendicular to the table is a magazine that holds the parts in oriented position parallel to the table surface. The magazine is shown being filled by the operator in Figure 4.

Fig. 2. These typewriter bars, blanked in the die above, are automatically stacked for more rapid and convenient handling in secondary operations, especially those in which magazine feeds are employed.

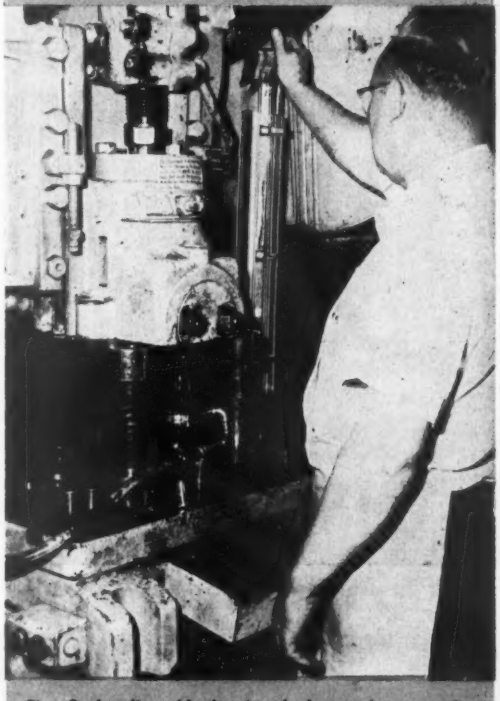


Fig. 3. Loading blanks (stacked on the preceding operation) into a magazine on a Niagara press equipped with a forming die to which blanks are fed by an automatic slide. As an air ejector is used, hands are always kept clear of the die.

At the left, attached to the table in horizontal position is a Bellows air cylinder. This is so controlled that it automatically feeds a piece into working position each time the tools in the

. . . Continued on page 147

Operations Expedited by Versatile Tooling

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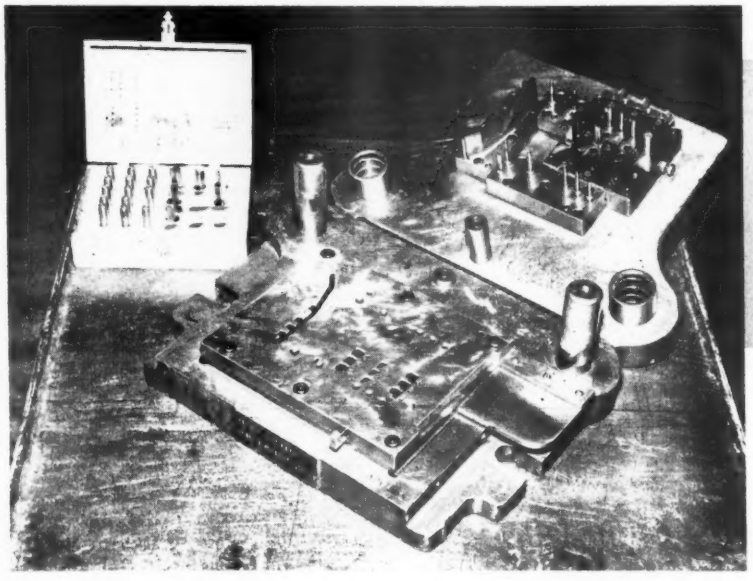

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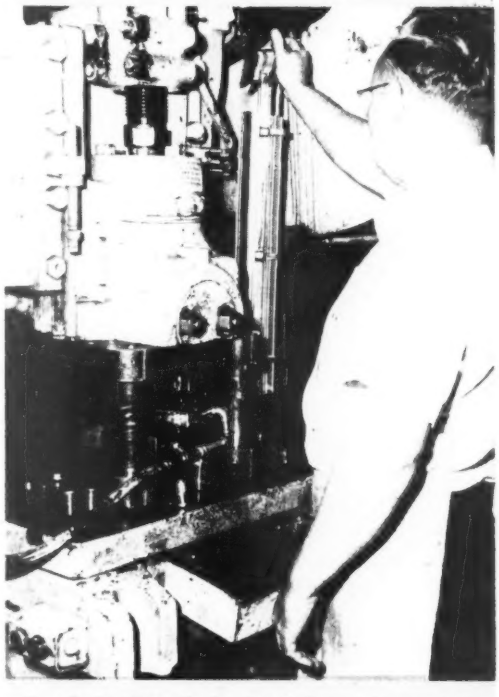

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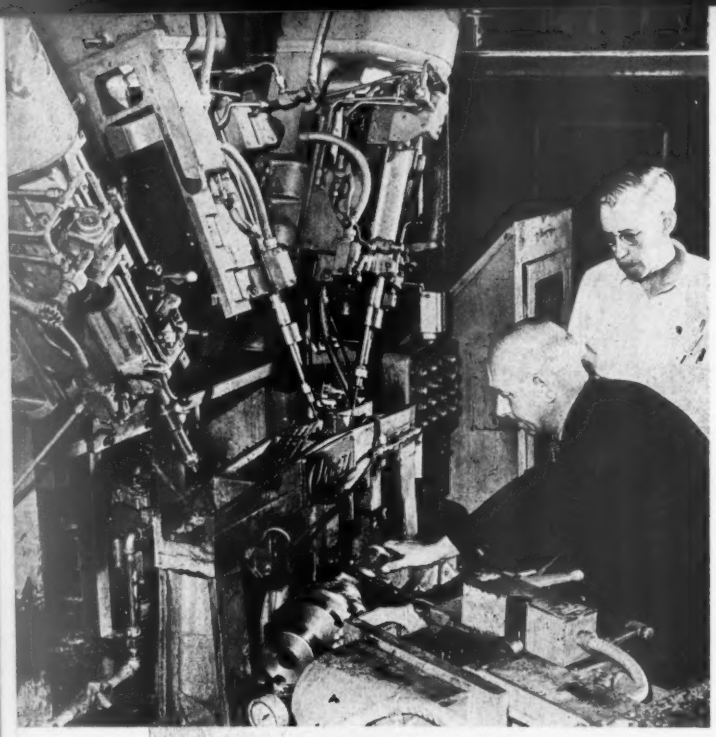
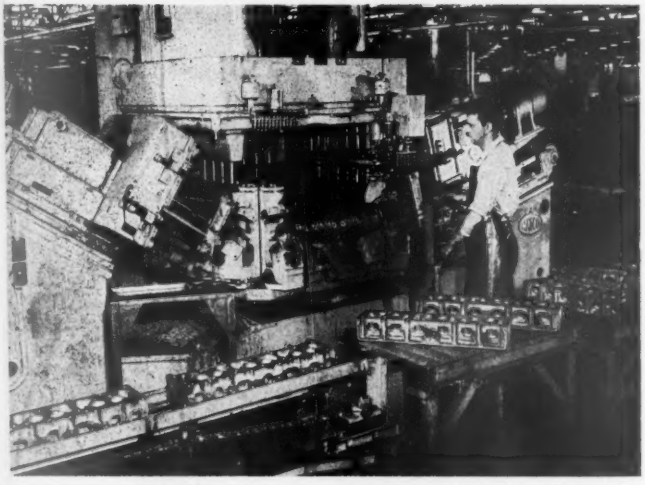
Hole Production in the

AUTOMOTIVE INDUSTRY

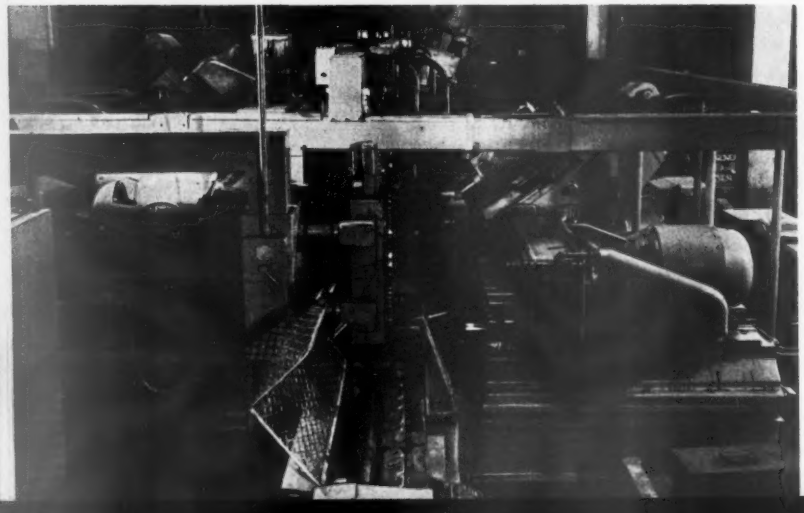


Special-purpose Avey drilling machine speeds up crankshaft production at the Chrysler Jefferson plant in Detroit.



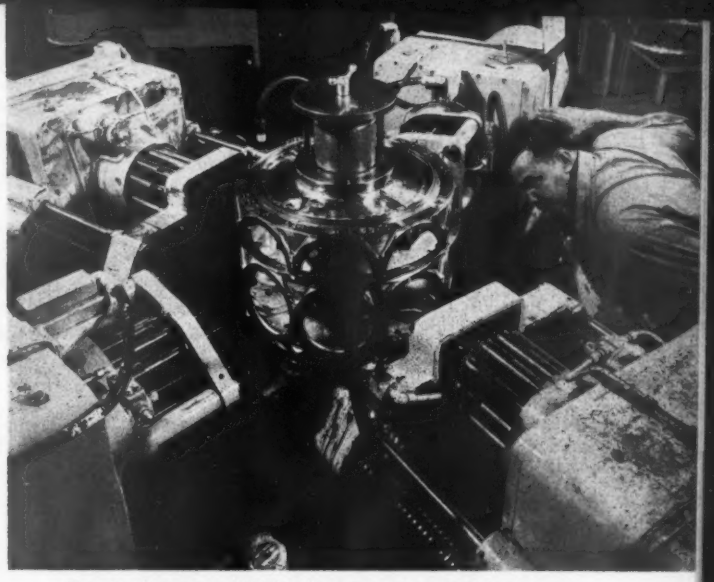
Cylinder units are bored and reamed on this Natco setup at the Chevrolet-Tonawanda plant.

Engine blocks at the Chrysler Corporation's modern DeSoto plant in Detroit move smoothly down the line between these Greenlee transfer machine units where cylinder head facing holes are drilled.

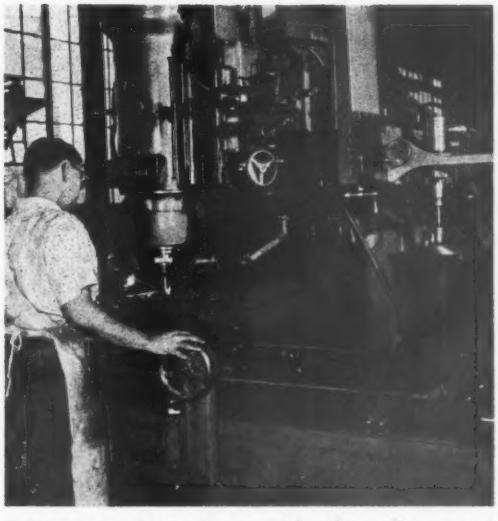


This special-purpose, multi-station, Natco transfer machine in Ford Motor Company's new Dearborn engine plant is used to drill, ream, and tap cylinder heads for Lincoln overhead valve V-8 engines. Of its 113 tools, 87 are standard. The other 26 tools, principally reamers and counterbores, are special. Tool standardization reduces inventory requirements, simplifies regrinding procedures, makes repurchase easier, and has numerous other advantages.

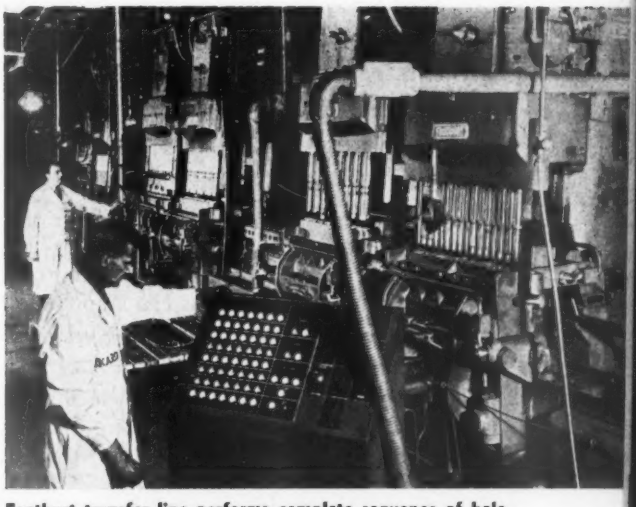
In this setup on an Advance drill press at the Cadillac Motor Car plant, bushing holes in a steering support are being drilled and tapped.



Tapping holes in a Wright aircraft crankcase at Chevrolet-Tonawanda, using a special Buhr drilling machine with four heads—10 spindles in the first two and 11 spindles in the others.

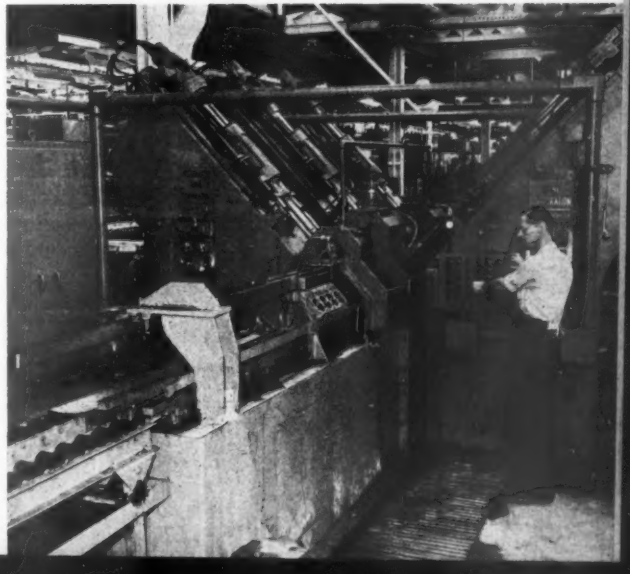


Before automotive parts are made, the tooling must be made. Holes play an important part in tooling as well as in production operations. Here, drilling and reaming operations are performed on heavy dies used in the New Crankshaft Press Shop at the Dodge Forge plant of Chrysler Corporation.



Footburt transfer line performs complete sequence of hole operations on engine blocks at the Packard Motor Car Company plant in Detroit.

Honing of cylinder bores at Chrysler Corporation's DeSoto engine plant in Detroit is shown here at the right. This Micromatic Hone transfer machine handles three engine blocks at a time, each of the six spindles having four indices. The DeSoto engine building operation was one of the first large-scale applications of automation in the automotive industry.



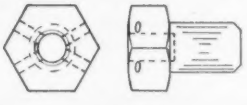
STANDARD UNITS AND AIR FEEDS SPEED UP DRILLING AND TAPPING

Continued*

by Carl F. Benner
Assistant Editor

Wire Lock Drilling Increased 50%

BERLEW PRODUCTS CORPORATION, of Detroit, Mich., produces this aircraft hex head



bolt on which specifications call for two wire lock holes be drilled through the head. The material is aircraft quality A & S 6320, 22 and 24. Hole diameter tolerance must be maintained within .002" to .005", and the holes must be held to true straightness.

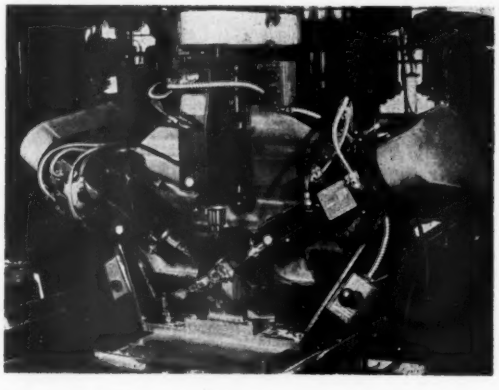
The special machine built to perform this operation consists of three Bellows-Locke drill units shown. It is arranged so that either one, two, or three of the drill units can be operated depending on whether the bolt specifications require that one, two, or three holes be drilled.

The bolt sizes which can be handled on this machine range from ¼" to ⅝" with hole sizes requiring drills varying from No. 60 to 3/16". Quantity production depends on the bolt size, drill size and the number of holes. However, as a comparison, 300—⅜" bolts can be drilled per hour whereas the count drops to 180 for ½" bolts. The average has been 240 pieces per hour.

The holding fixture is hex-shaped to accommodate the size of bolt to be drilled with drill bushings a part of the fixture.

As the operator loads the fixture, the start button is pressed. This starts the first drilling unit to advance toward the work. When this first drill has penetrated about three-quarters of the way through the head, a limit switch kicks in the second unit and when it has drilled three-quarters of the way through a limit switch starts the third unit. When the third unit completes drilling its hole it retracts to its starting position and automatically stops the machine.

With this sequence the first drill has completed its operation and has started to retract to its starting position before the second drill has penetrated far enough to interfere with the first drill. Thus the cycle is carried on to completion.



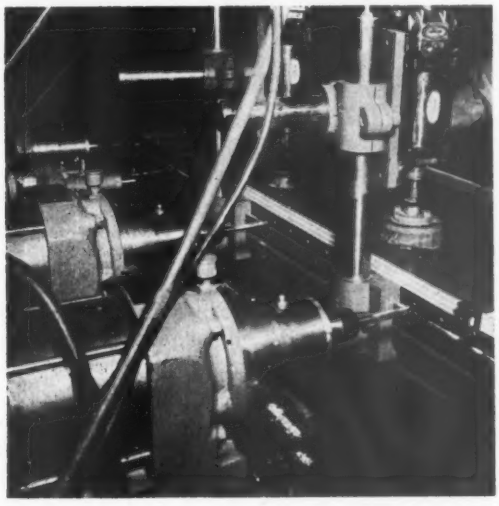
In case of breakage of the first or second drill a safety button is provided for the operator to push. This automatically throws all the drill units out and the machine will stop.

This job was formerly performed on a single spindle drill press with a three station indexing fixture. Difficulty was experienced with this setup in that the holes were not in their true position due to run out. This was attributed to the variation in feed which was controlled by the hand pressure of the operator. Also the operator had to index the fixture after completing each hole. As a result of the change over to the special machine, production has been increased by 50%, due to speed up of the operation and almost complete elimination of scrapped parts.

*The first part of this article appeared in the November 1953 issue of TOOLING and PRODUCTION, Page 46.

4-Spindle Machine Increases Production 30%

THE TEMPLE STUART CO. of Baldwinville, Mass. is one of the largest manufacturers of kitchen and dining room furniture in the country. One of their important operations is boring dowel holes in the edges of table top boards, so that the holes in adjacent boards match perfectly.



The four head multiple boring machine illustrated is setup to bore four dowel holes simultaneously in the edge of a table board. Bellows air motors supply the power to advance the boring heads up to the work. Also shown are two hold down clamps actuated by Bellows air cylinders. The function of these hold-downs is to hold the board in place and flat, since there is a tendency for the board to rise during the boring due to the pressure of the boring bits.

Both the boring heads and clamping cylinders are actuated by the trip of the foot switch. The clamps hold down the work while the heads bore in and retract automatically. The four heads are all mounted on individual ways and they are advanced and retracted by individual Bellows air motors. The boring heads can be set so that they will bore at different angles with any combination of angles required. This arrangement is desirable in the boring of chair parts.

Retracting of the third boring head is timed so that it retracts slower than the other three. Thus this head is the last to return to its starting position, at which time it trips a Micro switch which in turn releases the clamps, thereby releasing the board.

These boring operations were formerly performed with either single spindle or at most two spindle boring machines. With this type of equipment, a certain lot of parts would be run through the first setup and then a new setup would have to be made for the second group of holes. If the job was being run on a single spindle boring machine that would require four setups to bore four holes or two setups if a two spindle machine were used.

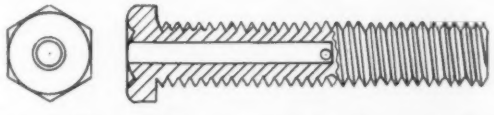
The new four boring head machine has increased production by 30%.

Production Up 25%, Scrap Down 50%

THE SPRINKLE MACHINE CO., of Galveston, Ill. deep hole drills this support pin, which is a component of the knee action section of an automobile. The material is 1322 steel, a special automotive steel. This pin is cold headed, and has a rolled thread.

The specifications require that a 7/32" diameter grease hole be drilled to a depth of 2¼" through the center of the head. A smaller hole must be drilled at right angles to the grease hole and intersect it at the 2¼" depth.

The equipment used in building the special machine to perform these drilling operations consists of two Delta 18" drill presses, one Bellows Sensitorque drill press feed with Hydro-Check, one standard drill press feed with Hydro-Check, two air motors with a standard foot valve, and two Ettco multiple drill heads.



One drill press is set to operate in a vertical position and is equipped with the Sensitorque drill press feed for the deep hole drilling. The other drill press is mounted to operate in a

. . . Continued on page 62

AUTOMATIC CONTROL
...from Wind Tunnels to Machine Tools

by A. G. Thomas
Research Associate
INDUSTRIAL RESEARCH INSTITUTE
University of Chattanooga
Chattanooga, Tennessee

WIND-TUNNEL CONTROL may appear to be far removed from ordinary manufacturing problems. Yet, a system that was originally conceived as having broad industrial application — including machine tool control — has useful possibilities in a major aircraft research program. In turn, the experience gained thereby should benefit the metalworking industry.

At Tullahoma, Tennessee, about 90 miles northwest of Chattanooga, there is being built the Arnold Engineering Development Center — named after Gen. "Hap" Arnold, head of the U. S. Air Force in World War II. This is a government-financed project, designed to provide the Air Force with the largest and best wind tunnel research facilities in the world.

The A.E.D.C. will have a number of wind tunnels, the largest being 14′ across the throat and requiring several hundred thousand horsepower to drive the air through the tunnel. The largest motors in the world — 83,000 hp each — are used for this transonic installation.

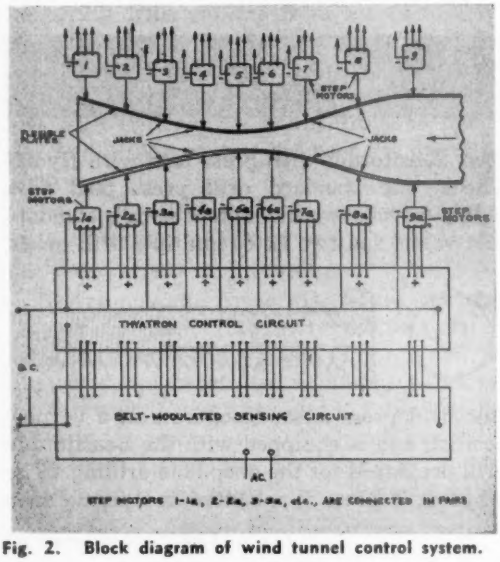


Fig. 2. Block diagram of wind tunnel control system.

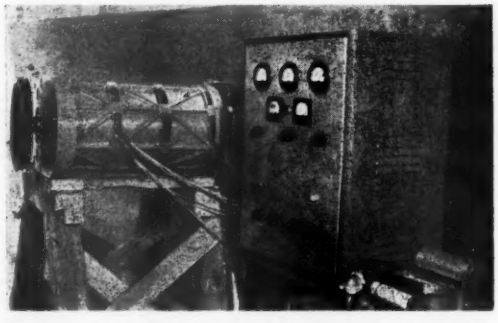


Fig. 1. Principal units of control system—three phase step motor, thyratron control cabinet, and belt or tape type commutator.

There are other tunnels of various sizes and air velocities, but the one of principal concern in this article is a hypersonic tunnel with a maximum throat area of 40″ square. This can be narrowed to a very small gap by means of flexible steel plates. Something like 100,000 hp is required to drive the air at very high velocity through this throat area.

In order to make wind tunnel tests of model airplanes, missiles, or other devices, to determine how they will behave in actual flight, there is much more involved than merely supporting the model in an air stream and recording its reactions. There are, for instance, problems of cooling the compressed air which otherwise might reach temperatures as high as 1600°F.; on the other hand, if the compressed air is suddenly expanded, the temperature may suddenly drop far below freezing so that any water vapor in the air will become solidified. These and many other difficult problems have to be met in operating wind tunnels.

A very important phase of wind tunnel operation is the control of the air stream passing through the throat of the tunnel. This control is effected by movements of flexible steel plates, which may be bent to various curvatures to form discharge funnels of various shapes and sizes.

In some cases these plates may be as much as 1″ thick and 15′ to 20′ long; and the stresses developed in the plates may be quite high, running into many thousands of pounds. The plates are, of course, bent least at the wide

cross-section of the funnel, and the stress increases as they are bent inward to form the narrow throat which may be only 4″ wide. It is very important that the stress be held well below the yield point; as, otherwise, the plates would not spring back to predetermined curvatures under pre-set conditions.

The flexible plates are stressed and bent to the desired curvature, as determined from calculations, by a series of suitably spaced pairs of jacks. It is necessary that these jacks provide precise control of the plates, to 0.001″ or better, since very small variations of curvature at high air velocities of several Mach numbers, or more, will materially affect the results.

In order to provide this precise control, the Industrial Research Institute of the University of Chattanooga has built a special step motor as shown to the left in Figure 1. The small, high velocity 40″ wind tunnel will require about 18 jacks and 18 motors for bending the plates to a minimum of 4″ and a maximum of 20″. The general arrangement is shown in Figure 2.

This special step motor is three phase, the rotor of each phase having the same number of poles as the associated stator. The stator poles are in alignment and the rotor poles are displaced relatively, so that the motor will always be in starting position. In order to make the motor rotate, the stator windings are electrically energized in sequence.

When any stator phase is energized, the associated rotor poles are magnetically snapped into alignment with the stator poles and are held there until the next stator phase is energized, at which time the preceding phase is automatically de-energized and the next succeeding rotor poles are snapped into alignment with their associated stator poles. Then the third phase is energized and so on. The rotor can be wound for additional torque or for reduction of field current, but it is not necessary. In the motor illustrated there are 72 poles in each rotor and stator phase, making a total of 216 steps per revolution of the rotor shaft.

The three stator field windings are shown in Figure 1 connected to a thyratron circuit housed in a cabinet. These are 105-type thyratrons carrying an average current of 6.4 amps. Each of the three tubes controls the direct current to a connected stator field winding, the circuit automatically extinguishing a conducting thyratron when any other one is fired. In this way the motor is always under control and is never in a free-wheeling or floating condition, with the result that there is no over-travel.

Each time a thyratron is fired the rotor revolves one step; and, if the rate of energizing the phase windings is fast enough to cause a rotation of about 20 rpm or more, the step movements are hardly distinguishable. The rotation appears to be continuous and yet, at moderate speeds, the rotor can be magnetically stopped within one step displacement, without over-travel. Also, the motor can be quickly reversed merely by changing the order of firing the thyratrons so that the third field winding is energized before the first, or vice versa.

Control of the firing of the thyratrons can be effected by a commutator supplying potential to the thyratron grids in order, or by a moving belt which can vary the grid circuits by magnetic, capacitive, or conductive action. Both a manually operated commutator and a belt type commutator are shown (Fig. 3), either of which can be plugged into circuit. The motor will follow exactly the rotation of the commutator, step by step; and, when the commutator is reversed in direction, the motor also reverses. Special mechanism, used to prevent oscillations or hunting, is automatically set according to the direction of rotation of the commutator. This control system is remarkably free from hunting and provides a precise means for accurate positioning of jacks . . . or any other members in other applications.

The belt control device (Fig. 3) comprises a housing containing five photocells, a small motor to drive the belt by means of rollers, and a showcase type lamp mounted above five openings in the casing cover, for admitting

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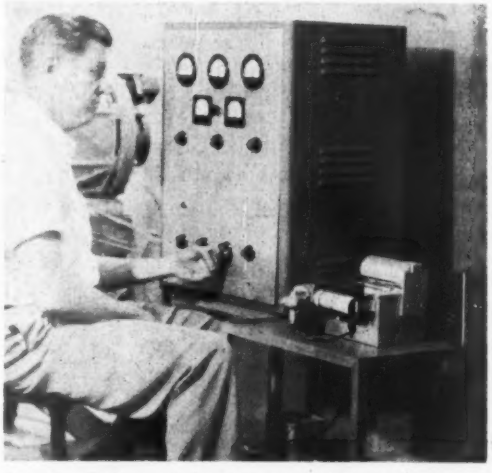


Fig. 3. Either a belt type commutator (center) or a manually-operated commutator (right) can be used in control of thyratron circuits.

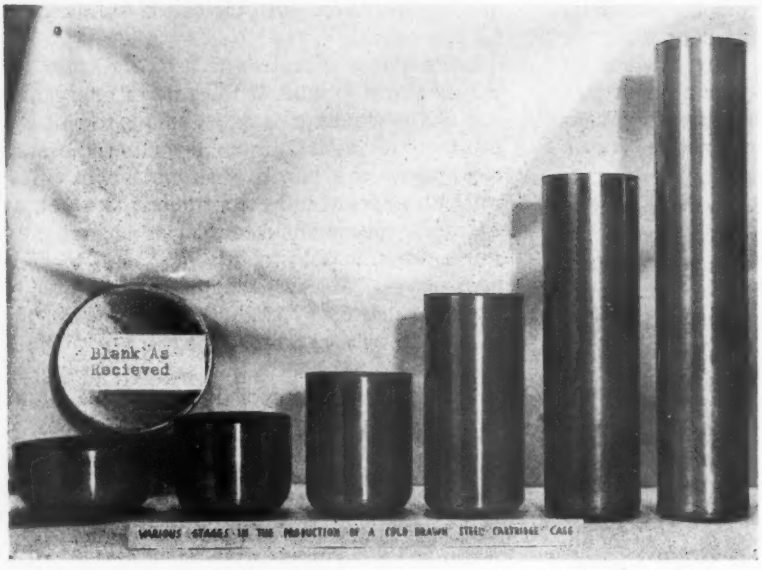


Fig. 1. Typical blank, cup, and draw sequence in press production of a steel cartridge case.

STEEL CARTRIDGE CASES

. . . their Cold Forming and Heat Treating

by S. S. Rice
Chief Metallurgist
Ekco Massillon Division
EKCO PRODUCTS COMPANY
Massillon, Ohio

TODAY WE ARE in a transition period in cartridge cases. We are converting from brass to steel. Many questions are asked regarding this conversion, perhaps the most frequent one being, "Why would you want to make cartridge cases out of steel?". The answer is simple. We don't want to make them out of steel; we **have** to. Cartridge brass is made of copper and zinc, and there just isn't enough copper and zinc to go around.

Cartridge cases as we know them today were first used successfully some 75 years ago. At that time they were made of brass; and, for 75 years brass has been a magic word in cartridge case manufacture. Many other materials have been tried by many nations, with varying degrees of success—or we might better say varying degrees of failure. As a substitute material for brass, steel showed the most promise; but it was not until World War II that some sizes of cartridge cases—and only some sizes—were satisfactorily made from steel.

Cartridge Case Functions

Just what is it that limits us so in the selection of materials? To understand this, we must first look at the functions of a cartridge case and the requirements which it must meet:

1. It must act as a container for the propellant powder.

2. It must provide rigid support for a projectile inserted into the mouth of the case. This projectile may be three or four times the weight of the case itself.

3. It must support the primer element in accurate alignment with the firing pin.

4. Upon firing it must expand, sealing against the gun chamber to prevent the backward escape of gases.

5. After firing it must contract, to permit extraction of the case from the gun.

Possible Types of Failures

During World War II, certain types of failures showed up in the firing of steel cases which, until they were eliminated, made the

use of steel undesirable. The most frequent types of such failures were:

1. **Poor Obturation.** Upon firing, the case does not expand satisfactorily to seal against the gun chamber. As a result the burning gases may escape toward the back. The gun tube may be damaged prematurely; and, much valuable pressure is lost that would otherwise be exerted against the projectile.
2. **Poor Ejection and Extraction.** After firing, the case has not contracted from the walls of the gun chamber. The case and chamber surfaces are in intimate contact, and removal of the case by the extractor is impossible. As a result the gun is at least temporarily put out of use.
3. **Base Rupture.** If an area of low strength exists between the head and the sidewall, it may break apart upon firing, even to the extent of complete rupturing of the head from the body of the case. The burning gases thus released may harm the gun crew; and the gun is put out of use if the extractor flanges have blown off with the head.
4. **Sidewall Split.** The wall of the case may burst open upon firing. Burning gases will escape backward; and the split, if severe, may cause the case to stick in the gun. Even if the split is small, it may have a detrimental effect upon the life of the gun tube. When we consider that some tubes survive a maximum of only 800 rounds under ideal conditions, we can see where any reduction in this life expectancy can be serious.

Metallurgical Problems

The above types of failures used to be more common in steel than in brass. To eliminate the possibility of such failures, we first had to understand why steel as a metal is more susceptible to such failures than brass.

The "sticker" type of failure is the result of failure of the case to contract sufficiently, after firing, to be ejected from the gun. Since brass has a greater tendency than steel to return to its original size, the steel, to do the same job, must be made far stronger than the brass.

With an obturation failure; the strength factor is again involved; but here the high strength of steel required to prevent "stickers" is the very thing which makes for poor obturation. A very strong sidewall may not yield enough to seal against the gun chamber.

The base rupture is a good example of impact failure. Cold-worked cartridge case steel has a much lower impact strength than cartridge brass. This low impact strength is exaggerated by inclusions, grain growth, notch sensitivity, and directionality—all of which assume much greater importance in steel than in brass.

Sidewall splits can be generally attributed to the low impact strength of the steel, and particularly when such impact strength is further reduced by the presence of die marks or surface defects. Here again notch sensitivity is much greater than in the case of brass. In addition, sidewall splits can be caused by segregation of impurities within the steel itself. If under the microscope we saw inclusions in cartridge brass that we see in the average high quality cartridge case steel, we would without question throw out the brass. Steel, however, is by nature a "dirty" metal, and we cannot expect to eliminate inclusions entirely. Instead, we must learn to live with them and hold them down to a safe minimum.

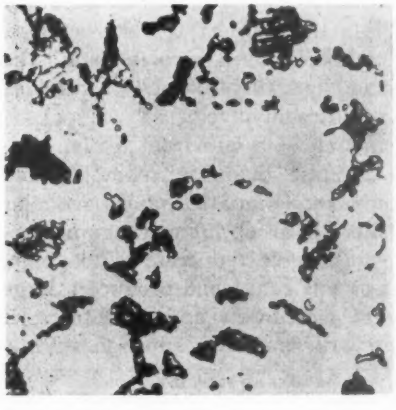


Fig. 2. Hot-rolled steel —1000X.

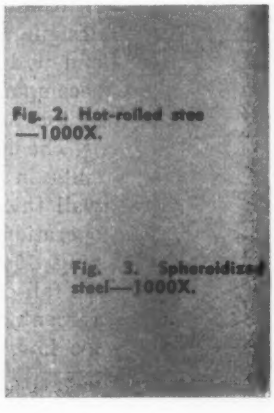
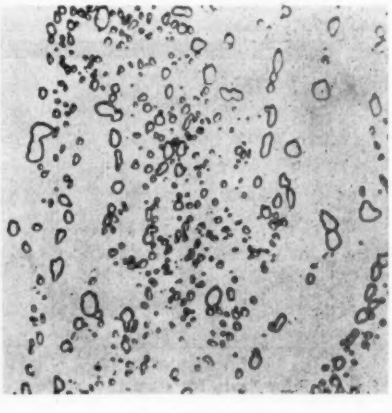


Fig. 3. Spheroidized steel—1000X.



In addition to the above problems presented by steel which are not generally encountered with brass, we have the great increase in production problems. Steel requires heavier equipment, more durable tools, better lubrication, higher temperature anneals, and so on. There is not a single operation which is simplified by the conversion from brass to steel. The more difficult the operation, the more difficult it is to make the product correctly. The use of steel, therefore, requires far more in the way of operational controls than does brass.

Such are the handicaps we face with the use of steel. To show how these are overcome, and how the cases are actually produced, let us take a tour of a typical cartridge case line. For this tour we have selected the 90-MM cartridge case, the highest pressure steel case successfully made today. We shall see how, with all metal-forming done in the cold state, a single piece of steel is converted into a finished cartridge case.

Cartridge Case Steel

The raw material is received from the steel mill in the form of circular blanks. (Fig. 1). The steel is plain carbon, in the range of .25-.35%. If we used steel with a carbon content below .25%, we would no doubt have a much easier time producing cases; but the physical properties would be too poor to permit satisfactory firing. If the carbon were above .35%, we could improve our physical properties; but production difficulties would be so greatly increased that mass production would not be feasible. We could use an alloy steel to improve physical properties; but, when we talk of all-out emergency production, the chrome and nickel required for such steels would be even scarcer than cartridge brass.

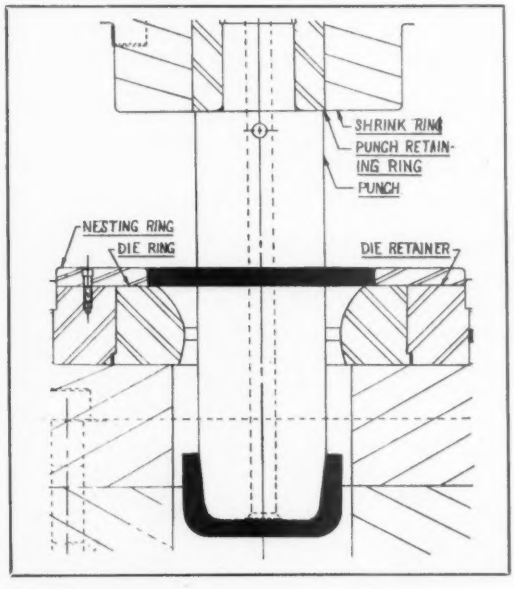


Fig. 4. Press tools for cupping operation.

The steel used must be of top quality. It has already been pointed out that there is no such thing as steel that is clean; but, we must insist on steel that is clean enough for this job. Blanks with detrimental seams, scratches, slivers, laminations, and other defects must be either salvaged or scrapped.

Finally, the steel must be spheroidize-annealed. This anneal is necessary if the initial forming operation known as cupping (Fig. 1) is to be carried out without prohibitive scrap. Spheroidizing is done at the steel mill by long-time (in the neighborhood of 50-60 hrs.) annealing at carefully selected temperatures.

Let us observe the effect of this spheroidizing-anneal. The steel as it comes off the hot mill is in the normalized condition, as illustrated in Figure 2. Such steel is highly suspectible to fracturing during the cupping operation. The aim of spheroidization is to break up the dark (pearlitic) constituent into smaller units and disperse these units as evenly as possible. The end product of the anneal is the spheroidized steel illustrated in Figure 3.

The Cupping Operation

The formation of a cup from a blank is diagrammatically illustrated in Figure 4. Without spheroidization, such a severe bend would cause fracture of the steel. Poor spheroidization, however, is not the only cause of breakage during the cupping operation. Defective metal may play an important part. Also, cup breakage can be caused by poor tool design. While this subject is very complex and will not be discussed here in detail, the accompanying chart (Fig. 5)* gives some idea of the possibilities involved.

The formation of a cup from a blank results in a definite diameter reduction and wall thickness reduction. On any particular operation, there is an optimum range of cupping. If the diameter reduction is too high, we fall out of this range and produce a large percentage of punch-outs and wall tears; if too low, we will encounter slippage. While

*Based on chart by George Sachs and James M. Taub.

this chart applies to a particular size cup and a certain tool design, other sizes and designs will give the same general results.

Another very important factor in the cupping operation is the control of wall thickness variation from one side of the cup to the other. A small variation at this operation will make for a very lopsided drawpiece later on. The variation is therefore controlled within limits of approximately 1% of the thickness of the blank.

Surprisingly enough, the top edge of the cup can be a vital factor in the production of a good case. When the blank is sheared from the steel strip, a rough shear edge remains. This edge is drawn up to the top of the cup, and exists as an area of unsound metal. The exact location of this unsound metal is of great importance. If it slopes toward the inside of the cup (Fig. 6) as the cup is drawn out, the bad metal will run further and further down the inside wall. This metal will eventually break off, causing trouble in drawing, or will have to be trimmed off. If too much has to be trimmed off, we will end up with an underlength cartridge case.

An even more serious condition is the V-shaped edge pictured in Figure 7. As the sidewalls are drawn out in succeeding operations, the "V" extends deeper and deeper down the wall. As a result we have a laminated wall, which may or may not be possible to inspect for visually.

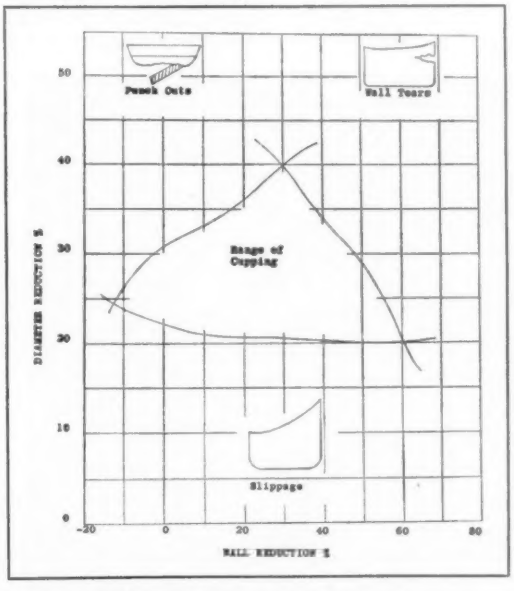


Fig. 5. Approximate limits of satisfactory cupping.

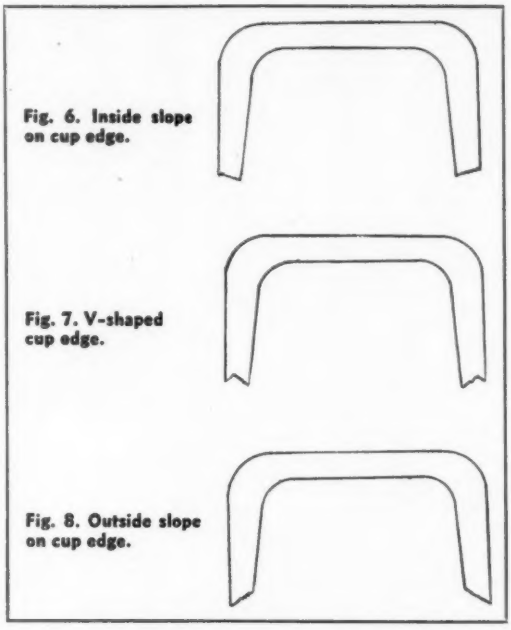


Fig. 6. Inside slope on cup edge.

Fig. 7. V-shaped cup edge.

Fig. 8. Outside slope on cup edge.

Usually the most favorable type of edge is the one which slopes gently outward (Fig. 8). As deep drawing proceeds, the outside of the wall—receiving more of the working—is pulled up to or a little higher than the inside. The unsound metal is confined to the top of the drawpiece, and can be easily trimmed off with a minimum loss of metal.

The shape and position of the cup edge is controlled partly by the shear angle of the blank, but mainly by cupping punch and die design.

The importance of proper formation of the cup cannot be over-emphasized. This cup is vital to the subsequent operations. We are wasting our time if we try to make a good case from a bad cup.

Annealing, Pickling, Lubrication

Since the cold-working of metal induces what is known as work-hardening, the cup ends up harder than the blank from which it originated. This metal cannot be work-hardened indefinitely without the application of "softening" anneals from time to time. The limiting factors in work-hardening are the press capacities (heavier presses being required to work the harder metal) and the ultimate strength of the metal, which is eventually exceeded. The metal must therefore be softened prior to every major cold-working operation. Such softening is effected by annealing within the range of 1200-1300°F.

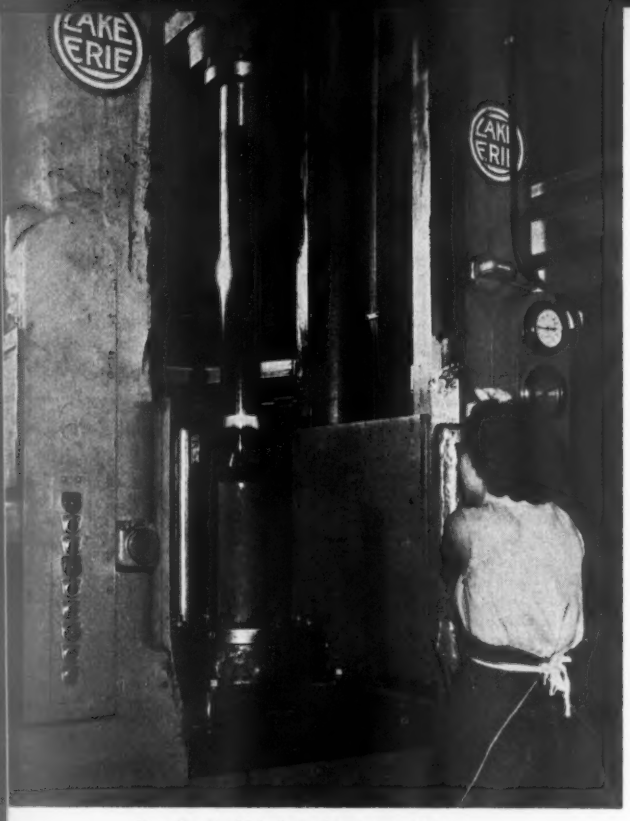


Fig. 9. Typical deep-draw operation.

Even though the metal has been softened, before further cold work can be applied the surface must be conditioned. In this field, possibly more than any other, it is worth noting the progress that has been made over the past ten years. Originally the metal was put through annealing furnaces without regard for atmosphere control. A heavily scaled surface would be obtained which would require strong acid pickling at high temperatures. Sometimes one pass through the pickler was insufficient, and a second or even third would be required. It was not uncommon to run across drawpieces which had been so over-pickled that there was insufficient stock remaining to draw into a finished case.

After pickling, the piece was sent to the press for deep drawing. A typical draw is shown in Figure 9. Ten years ago we used, for lubrication, a recirculating liquid. This liquid was directed against the die, and also ran downward through the hollow punch to wet the inside of the drawpiece. The operation was messy to say the least. In the pits below the presses there accumulated everything from rats to last week's lunch scraps. The press operators very often became covered with the lubricant. And with all the potential messiness of liquid lubrication, a really effective wet lubricant was never found.

Today the story is different. Annealing is usually carried out in controlled-atmosphere furnaces designed to produce only a slight oxide on the surface of the steel. This oxide is then pickled off with mild acid, the surface thus being roughened up to provide a "tooth" for the lubricant. After the pickling operation, the drawpiece is subjected to a solution which applies a zinc phosphate coating. While this coating, in itself, is not sufficient lubrication for cold-working, it does form an excellent parting agent between the tools and the work. On top of the zinc phosphate coating is applied a hot soap solution, which dries very quickly. This soap is no miracle formula, but very similar to the sudsy material used in the kitchen sink. It is an exceptionally good lubricant for the job, and —what is just as important—has eliminated the problems involved in the use of liquids at the press.

Cupping is followed by five deep draw operations (Fig. 1). Prior to each draw, or redraw, the story is the same: anneal, pickle, phosphate, soap. Each draw, however, must be treated individually as to tool design. Here three points are extremely important. We must have the proper diameter reductions from draw to draw; we must have proper wall thickness reductions; and the punch noses in the vital area between wall and base must blend from one draw to another.

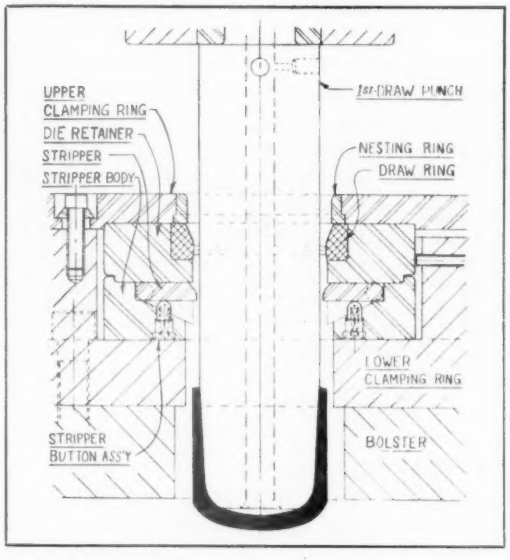


Fig. 10. Typical draw tools.

Figure 10 illustrates a typical draw tool set-up. Such an operation is run on a hydraulic press of 75 to 200-ton capacity, the size depending upon the particular draw. The draw punch is made of hardened and carburized steel, chrome-plated to about 0.0005". The die ring is cemented tungsten carbide. The drawpiece is stripped from the punch on the upward stroke, by contact with spring-actuated "stripper-fingers."

Today, we often hear the phrase "double pass"—the idea of running from one draw directly into the next without anneal, pickle, phosphate, soap. This is very often possible because of the unusually good drawing surface now existing as a result of the phosphate-soap coating. However, we cannot do this indefinitely because of the limitations of press capacity and ultimate strength of the metal. On a single pass, it is unwise to exceed a 60% reduction in metal thickness. We should not expect the total reduction on a double pass to exceed 75%.

The Heading Operation

When the case is finally drawn to full length and trimmed evenly at the mouth, it is subjected to a very important and intricate operation—heading. Figure 11 illustrates the shape acquired in this cold-forming job. The ram of a 2500-ton hydraulic press descends upon the base of the inverted case, exerting some 1600-2000 tons pressure to flare out the metal to a shape that is to end up as the extractor flange. As applied to brass, this could be done in a single operation. With steel, however, two operations are

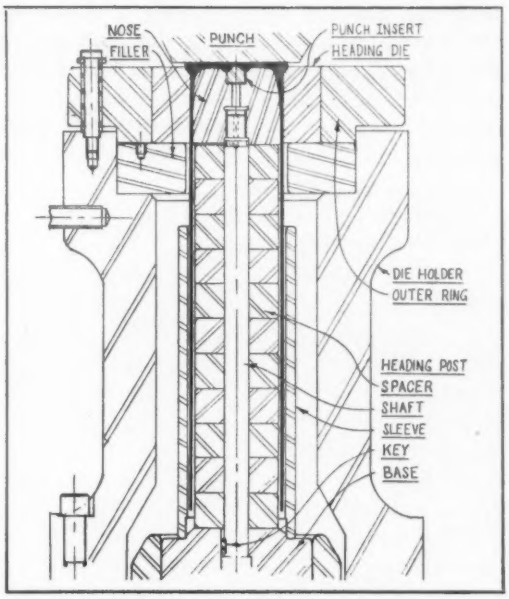


Fig. 11. Typical Tools for heading operation.

usually required because of the relatively poor flow characteristics of steel. The steel, therefore, before it reaches the heading operation, has already undergone pre-heading on an intermediate drawpiece.

Pre-heading, plus the careful blending of draw punches, plus a carefully controlled heading operation, are all aimed at protecting the vital radius area joining the head and sidewall. The condition of this radius can be checked by sectioning and etching. Figure 12 shows a desirable flow pattern, with a minimum of distortion. Figure 13, on the other hand, shows an unsatisfactory pattern,

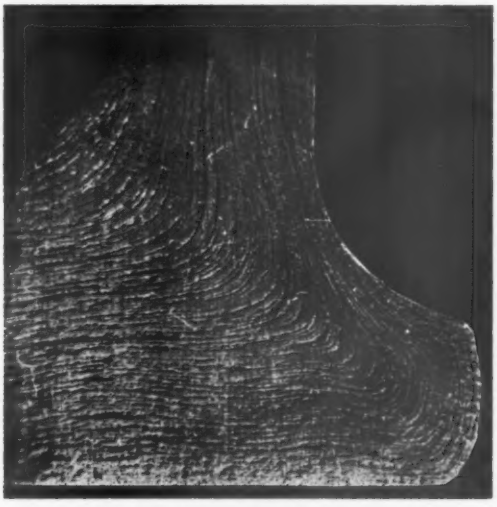


Fig. 12. Satisfactory flow pattern in the case head.

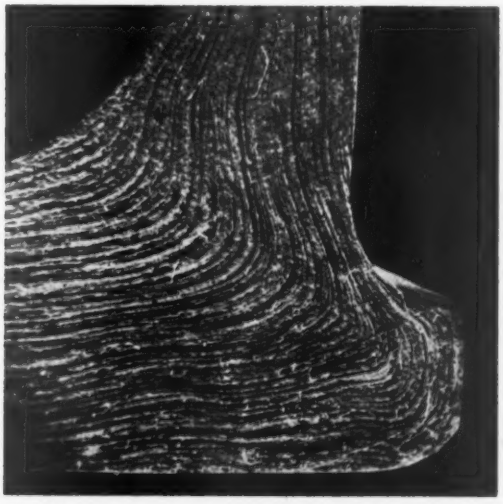


Fig. 13. Unsatisfactory flow pattern in the case head.

with the lines of flow tending to form an "S" where the sidewall joins the head of the case. In such an instance, a base rupture during firing is possible. Needless to say, the heading operation is checked regularly, and anything the least bit questionable must be considered unacceptable.

Heat-Treating and Tempering

The next major operation is heat-treating. With a brass cartridge case, the cold-working put into the lower sidewall will afford sufficient strength to permit satisfactory extraction from the gun after firing. With a steel case this strength is even greater, but not great enough because of the inferior "spring-back" characteristics of steel. The case must be strengthened above and beyond the cold-worked condition. This is the reason for heat-treating the lower sidewall area.

The case is inserted into an induction coil which selectively heats the area which must be strengthened. The total heating time is just 11½ seconds, after which a pressurized water quench is applied. With this quench, full hardening of the steel is effected.

Because of the intricate nature of the heat-treating operation, there are many possibilities of failure. We may have variations in power input, in water quench temperature, in water quench pressure, in timing, etc. A case poorly heat-treated may be worse than a case not heat-treated at all, since the latter at least possesses cold-worked hardness. Yet, whether the case is good or bad, coming out of the induction heater it is likely to look the same. Because of the importance of the physical properties in this area, it is mandatory that every single case be tested for satisfactory heat-treat.

Fortunately there is an important characteristic of steel, easily measured, which varies directly with effectiveness of heat treatment. The more effective the hardening process, the less magnetic the steel. With the use of a piece of equipment known as a magnetic comparator, the magnetic properties of any cartridge case can be measured in relation to a standard case. If the magnetic properties are greater than standard, we know the heat-treatment is not as good. By taking a just-passable case as standard, we can set up the comparator to automatically accept or reject every case off the production line.

Although full hardening is desirable in the heat-treat operation, the metal cannot be left in this condition. A quenched structure is very poor in impact properties, and must be drawn back to a satisfactory point. The higher the tempering temperature, the greater the toughness of the steel. Unfortunately, however, the higher the temperature at which we draw, the poorer will be the hardness, yield strength, and tensile strength. A compromise temperature is therefore necessary, and must be carefully selected and controlled.

Final Operations

After tempering the case is tapered, with the mouth being necked in some 22% in a single cold-forming operation. The head is then machined to form the extractor flange and primer hole. For this, a four-station New Britain Gridley automatic screw machine is used. As a final metalworking operation, the primer hole is then threaded. A localized mouth anneal, applied by induction heating, softens the mouth to permit crimping around the projectile.

The cartridge case up to here has been inspected periodically at every operation. At this point every case is inspected for every dimension, and visually examined for metal defects. Following inspection, the cases are subjected to a stress relief anneal of 650°F.

While brass is highly resistant to corrosion, steel is highly susceptible. For this reason, a protective film is applied to the steel in the form of a baked-on phenol-formaldehyde varnish. It is important that this film be held within the thickness range of 0.0003 to 0.0010"—thick enough to afford proper protection, but not so thick as to interfere with the rigid dimensional tolerances of the cartridge case. The cases are varnished by immersion into a dip tank, after which they are permitted to drain and are then deteared. This "detearing," by use of 80,000 volts at low current, electrostatically pulls off the excess paint which has drained down to the open end of the inverted case.

With final inspection completed, the case is now ready to ship to the loading plant.

Now, just what is the present program in steel cartridge cases? An attempt is being made to develop every possible case out of steel. If the cold war should turn into a hot war, we shall make out of steel every size case which has proved to be as good as its brass equivalent. In this way, much copper and zinc will be saved. We may be a have-not nation in cartridge brass, but we don't intend to be a have-not nation in good cartridge cases.

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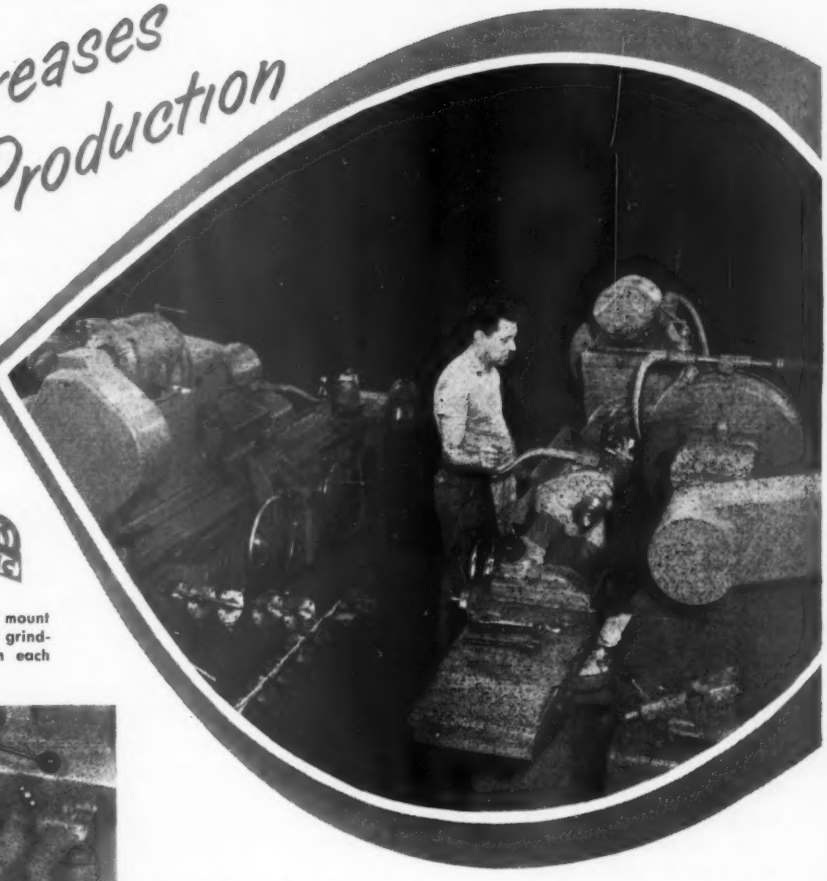

Below: A two wheel mount provides the means of grinding two diameters in each infeed cycle.

CINCINNATI FILMATIC 10"x 36" Plain Hydraulic Grinding Machine. Also available in 14"-L size, each in 18", 36", 48", 72" and 96" lengths. Catalog No. G-603.

A simple maxim for reducing costs of centertype grinding: "combine operations." Whenever operations can be combined, costs will be lowered, sometimes cut in half. In the illustration on the opposite page, two CINCINNATI FILMATIC 14"-L x 36" Plain Hydraulic Grinding Machines, in the plant of a prominent automotive parts manufacturer, are tooled up to grind simultaneously two diameters of steering knuckles.

One man, operating two machines, increased production 50% over the output of two operators on the two machines which were replaced.

Centertype grinding on CINCINNATI FILMATICS offers many advantages for work of this type. FILMATIC spindle bearings of themselves—a CINCINNATI exclusive—are reason enough to choose CINCINNATI, for they are self-adjusting, good for the life of the machine. ¶ Would you like to know more about these CINCINNATI FILMATIC Grinders? Write for illustrated catalog No. G-603.

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CIRCLE INFORM-A-GRAM KEY NO. 59

. . . Automatic Control, from page 51

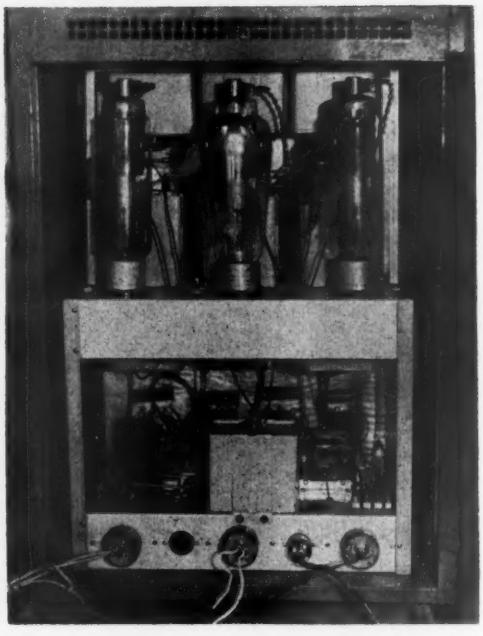


Fig. 4. Interior of thyratron control cabinet.

light to the photocells when the holes are uncovered by perforations in the passing belt. This belt may, if desired, be of transparent plastic material with printed dark spots for control of the thyratrons by reduction of light rather than the reverse. In this case the thyratron bias would be positive instead of negative as before, and the reduction of light causes the positive bias to fire the associated thyratron. Normally, the light would maintain a negative thyratron bias.

The belt has three rows of spaced holes, which — when the belt is being driven by a motor — modulate the light. The holes are so spaced that the three photocells associated with the grid circuits of the thyratrons are illuminated in the desired order to cause firing of the thyratrons in the same order, with the result that the motor revolves in one direction. In order to reverse the direction of rotation of the motor, the phasing of the holes is reversed so that the order of firing of the first and third thyratrons is reversed. If the belt is driven at uniform speed, the rate of rotation of the motor is inversely proportional to the longitudinal spacing of the holes or spots. The belt also has, where necessary, a clear edge strip for admitting light to a fourth photocell that controls a relay circuit regulating the oscillation-prevention means. If desired, a fifth photocell can be used for cutting off the power automatically at the end of a program.

The photocell outputs are fed into 6L6 amplifier stages. It is not necessary, however, to employ photocells, as the moving belt can make and break Micro switches or other contacts connected directly with the grid circuits of the 105 thyratrons. In this case, no amplifier stages for these tubes are required. In the case of small step motors, it would not be necessary to use thyratrons as switching elements since the commutated current can be supplied direct to the field windings. This can also be done for larger motors, but it is preferable to use thyratrons for the larger currents, say for a few amperes and higher.

Now to revert to the wind tunnel, we will assume that the jacks for bending the flexible plates are driven by step motors of the above type through suitable reduction gearing. The gearing and the number of steps of the motor can be so chosen that one step movement of any motor will cause the plate to be moved 0.001″ or less in the desired direction.

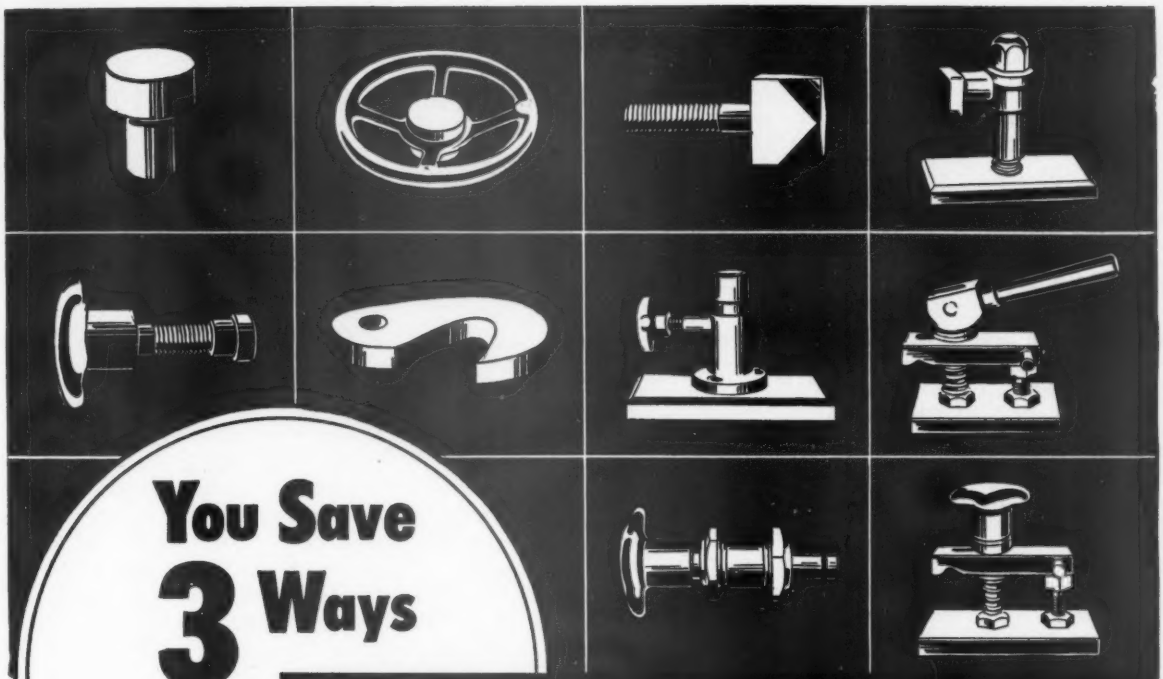
By calculating the tape and by punching or printing it properly, all the step motors can be controlled in unison, so that any desired curvature of the flexible plates can be maintained at all times. In order to do this, some motors will be running faster than others, and some may be rotating in reverse direction while others are rotating forward. In any case, all the motors are under control of the coordinating tape or belt, and the plates are bent accurately according to information on that tape. Besides the convenience of merely pressing a button and having the flexible plates automatically set in a few minutes to a mathematically accurate curvature, a very important feature of this step motor control system is its reliability of operation and the greatly reduced possibility of permanently bending the plates beyond the yield point. It is difficult to see how any other system could approach the step motor system in accuracy and reliability.

It is, of course, possible to make several changes of the belt-regulated positions by means of a manual commutator. From a practical standpoint, a belt about 4″ wide can control 10 step motors; however, this belt could be made even narrower if necessary.

There has been some discussion of connecting a computer directly to the step motor system so that the flexible plates will be set to curvatures as determined by the computer, without using the intermediate belt. This may be quite possible and studies are being made in that connection.

The motor as illustrated is a powerful torque device. It is approximately 14″ in diameter,

. . . Continued on page 118



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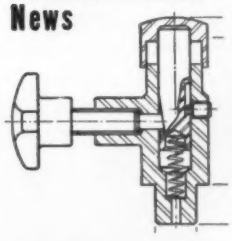

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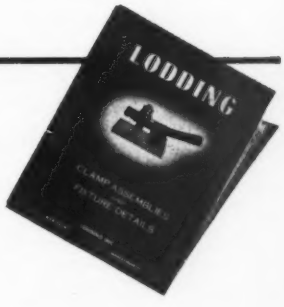


CIRCLE INFORM-A-GRAM KEY No. 61

. . . Standard Units, from page 49

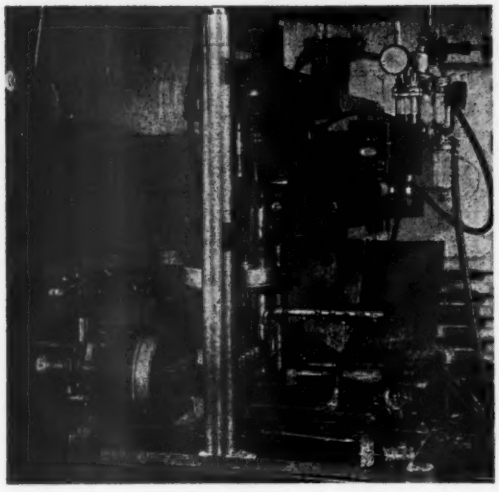
horizontal position and is equipped with the standard drill press feed.

In starting the drilling cycle, the operator loads four pins in a part holder and places it in the air clamp, then steps on the foot air valve which clamps the holder. After clamping the holder he starts both the Sensitorque feed and the other drill press feed, thereby drilling, simultaneously and automatically, the two holes in each of the four pins. When the drilling heads have automatically retracted to their starting positions, the operator again steps on the air valve to release the clamping vise. He unloads the four pins, reloads the holder, and repeats the cycle.

It can be seen that drilling the 7/32" hole to a depth of 2¼" would require that the drill be retracted several times to relieve the drill of chips. It is for such a relieving operation that Bellows developed the Sensitorque drill press feed.

The Sensitorque measures the torque on the drill and retracts it as necessary to prevent breakage, should the drill clog, run dry of coolant, or seize in any way. The drill is then immediately returned and eased into the work by a built-in Bellows Hydro-Check. This cycle is repeated as often as needed, until the job is completed. The amount of withdrawal may be adjusted from 0 to the full 6" drilling stroke. It has no electronic tubes, but works on a system of aircraft-type relays. The sensing unit may be cut out when desired, without disturbing the sensitivity setting. It may be set to operate as a standard drill press feed, as well as a torque-sensitive deep hole drilling devise.

When this company started furnishing these pins to the automobile manufacturers, they equipped their presses with the standard Bellows drill press feeds, however retracting the

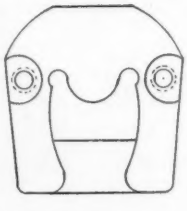


drill to clear it of chips was a manual operation. It was their experience that special pains had to be taken in training operators to retract the drill when the drill flutes became loaded with chips, since they had to depend to a large extent on the sound made by the drill press as the signal to retract the drill. In most cases it took three to four months to train an operator to the point where he did not have an excessive number of broken drills, and broken drills usually resulted in a scrapped pin.

About the only change that has been made in this machine is the substitution of the Sensitorque feed for the standard drill press feed. Production has been stepped up from 1600 pieces in 8 hours to 2000 pieces. Other advantages which contribute to a decrease in production costs are: savings in drill costs, drills last about twice as long as formerly; about 50% reduction in scrap due to less drill breakage; and the operator training period reduced from three to four months to two and one-half hours.

2400 Pieces Tapped per Hour

SUPER PRODUCTS COMPANY of Providence, R. I. is producing the part shown in this operation. It is a Bakelite remote starter block used in fluorescent lighting fixtures. Two holes tapped in the block have to be held to a tolerance of plus or minus .004".



The equipment consists of a Delta drill press, a two spindle Jarvis Torqomatic tapping head, a 12 station rotary feed table and drill press feed, both made by Bellows.

In the operation of this machine, the operator places the blocks in the loading station of the rotatory table. As the table revolves to the tapping station, it dwells an interval of

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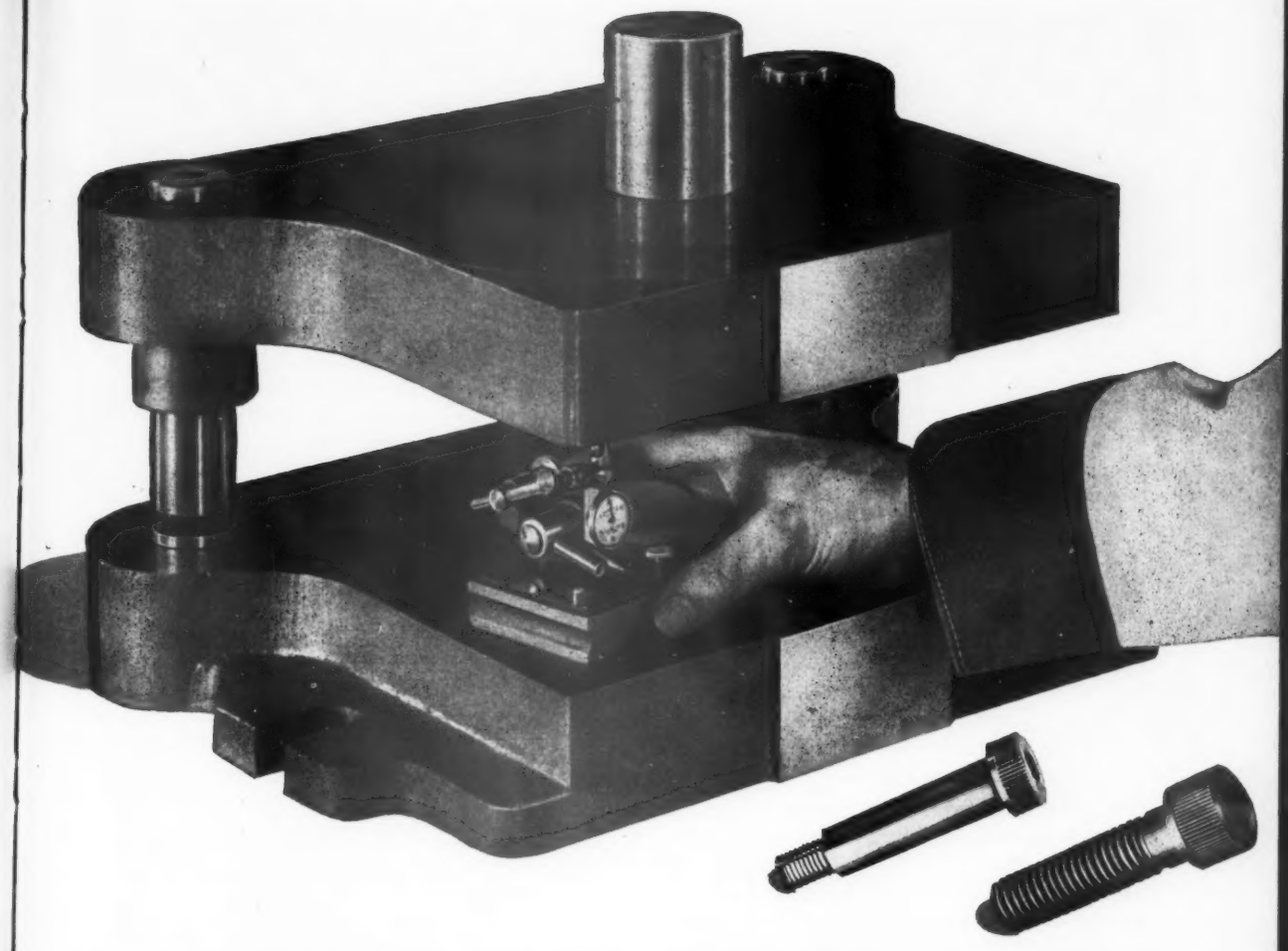

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CIRCLE INFORM-A-GRAM KEY No. 63

HARDNESS TESTING EQUIPMENT AND METHODS

Continued *

by John E. Hyler

ROCKWELL TESTS are similar to Brinell tests to the extent that hardness numbers are used to express degrees of indentation on test pieces, where the unit indenters act under given static loads. Different loads and penetrators are employed, depending on conditions of the test. Indenters and loads employed in Rockwell tests are smaller than those used for Brinell. Therefore, Rockwell indentations are smaller and have less depth. Also, Rockwell tests may be applied to materials having greater hardness than can be checked by the Brinell method. In general, the Rockwell method is considered faster, because it gives direct readings. It is therefore popular with many.

To eliminate errors in measurement of depth of impression, due to surface imperfections on the work, or varying cold work distortions which occur around the periphery of all indentations, Rockwell testers are designed to make two, superimposed impressions. The first is made with a load of only ten kilograms. The second and larger load then makes the secondary indentation. After the initial load has been applied, the indicator on the dial of the machine is set at zero. Thus, only the difference between depth of the initial-load indentation and that of the indentation produced by the larger load is measured.

In other words, total depth of indentation is entirely ignored, because measurement of hardness depends solely on the increase in depth due to the increase between minor and major loads. Different special schedules are at times used with Rockwell Machines, which are identified by their different types of penetrators, and different loads in kilograms. Scales known as A, B, C, D, E, F, G and K have all been employed, but all of these are special with the exception of scales B and C. These are known as standard scales, and are referred to as Rockwell B and Rockwell C, respectively.

*See page 50 Tooling & Production, March 1953.

B and C Scales Compared

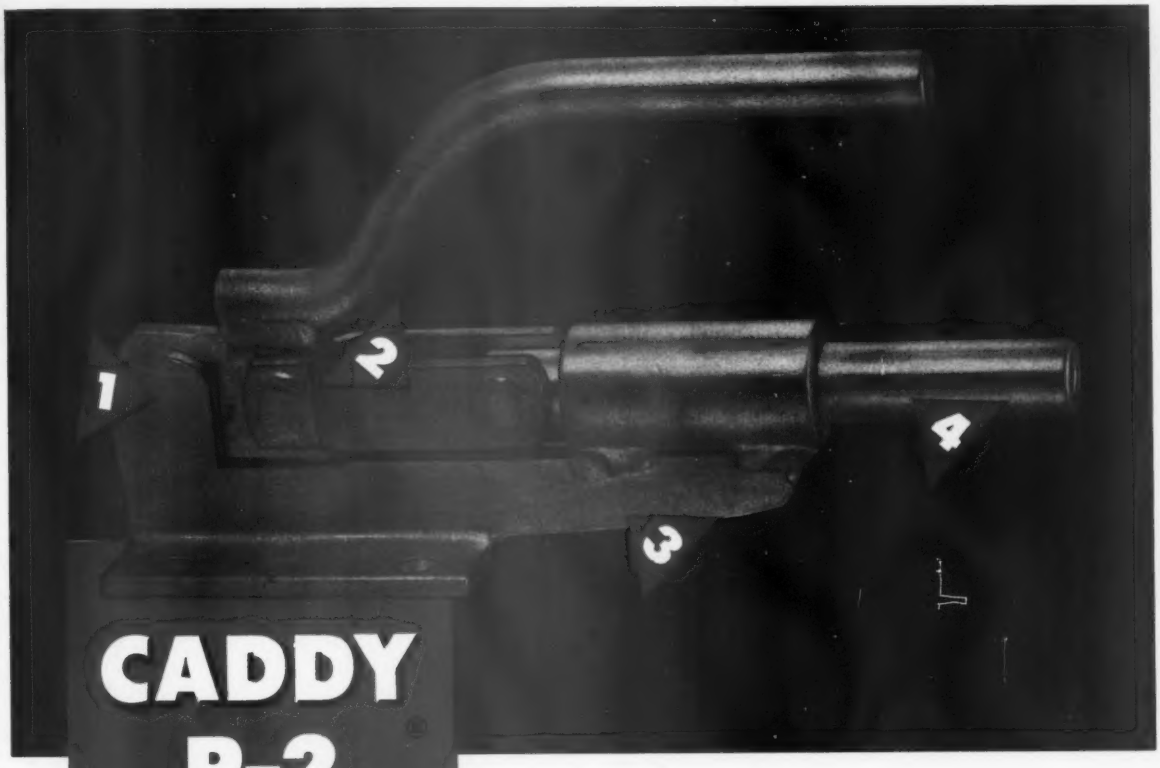
The B scale relates to tests made with a ball 1/16" in diameter, and with a major load of 100 kilograms. The C scale relates to use of a "Brale" diamond penetrator, with a major load of 150 kilograms. By far the majority of all Rockwell hardness tests are inspection tests on hard steel parts, where the sphero-conical diamond penetrator is used with a major load of 150 kilograms, all such hardness readings being invariably prefixed by the symbol C. The next

Photo courtesy Wilson Mechanical Instrument Division, American Chain & Cable Company, Inc.

Fig. 1. This is a standard Rockwell hardness testing machine having eight inches of vertical capacity, and from 5¼" to 5½" horizontal reach. This is a type of machine suitable for use in most plants, much used both in tool rooms and for production testing. If desired, a larger-diameter work support table may be applied to the machine, as well as other work support accessories.

largest application of hardness testing with these instruments is on rolled, drawn, extruded, and cast metals. In this range of work, (except for very soft metals or very thin pieces) the penetrator employed is the 1/16"-diameter steel ball, with the standard major load of 100 kilograms. The prefix to

. . . Continued on page 75



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INCLINABLE PRESSES

A new illustrated booklet on long slide inclinable presses has been issued by the V & O Press Co. The publication contains 19 pages of text and illustrations, plus charts and diagrammatic views.
Circle Inform-A-Gram No. E1.

LIGHTWEIGHT LOCK NUTS

This Quick-Pic catalog contains engineering data and a weight-saving chart on the Kaynor Co. "Kaylock" nut, which is formed of annealed steel. Besides being lightweight, these nuts also are self-locking.
Circle Inform-A-Gram No. E2.

PRODUCTION PROVED DIES

The story of B. Jahn is the story of progress in quality tools and dies. An illustrated booklet tells you how the B. Jahn Mfg. Co. steadily progressed from a 3-man die shop to its present-day large status.
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HYDRAULIC CYLINDERS

Carter Controls, Inc., presents information on its 1500 psi series hydraulic cylinders in Bulletin No. 1500. The folder contains illustrations, specifications and cross-sectional views of the cylinders.
Circle Inform-A-Gram No. E4.

CLAMP ASSEMBLIES, FIXTURES

This fixture catalog, put out by Lodding, Inc., offers you a selected group of standard assemblies and details. Grouped for your convenience are the components necessary to standardize tool engineering practice.
Circle Inform-A-Gram No. E5.

PRECISION PUNCHES

Porter Precision Products is proud to present its Catalog No. 104 which illustrates an expanding line of 3-P punches, retainers and button dies. This informative publication contains specifications and diagrams also.
Circle Inform-A-Gram No. E6.

CARBIDE TOOLS

Precision ground carbide tools made by the Atrax Co. are studied in detail in this highly informative catalog. Actual case histories help describe the firm's end mills, reamers, burs and boring bits. Ask for Catalog No. B-240.
Circle Inform-A-Gram No. E7.

WHEEL DRESSING

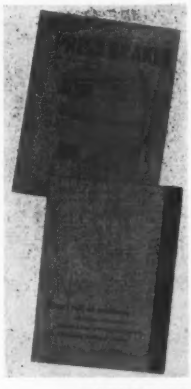
Here is data on the Vinco Corporation's B-1 (angle tangent to radius) Dresser. Operating data, specifications and illustrations are included in this informative catalog now being offered.
Circle Inform-A-Gram No. E8.

POWER SHEARS

Steelweld pivoted blade power shears are illustrated and described in literature now available from the Cleveland Crane and Engineering Co. Highlighted are the shears' many advantages.
Circle Inform-A-Gram No. E9.

QUADRILL TURRET HEAD

Complete information on the Quadrill Turret head and a similar 4-head attachment for taps is available in a new 4-page brochure just released by the Chicago Quadrill Co. Included in the folder are illustrations and diagrams.
Circle Inform-A-Gram No. E10.



PRESS BRAKE

Features of press brakes made by the Service Machine Co. are displayed in this SEMCO catalog. Such advantages as buttress threads, fine adjustments, vertical gage and rugged construction are discussed.
Circle Inform-A-Gram No. E11.

SALT BATHS

A lap full of problems can be solved by teaming Cyanamid heat treating compounds with Cyanamid technical service. You can find out how this is done in the American Cyanamid Company's attractive illustrated booklet on salt baths.
Circle Inform-A-Gram No. E12.

MALCOMIZING???

What is Malcomizing? How is it done? And how does it work? Answers to these questions can be found in an informative brochure available from the Lindberg Steel Treating Co.
Circle Inform-A-Gram No. E13.

ABRASIVE CUTTING

General recommendations for the selection of Allison abrasive wheels are presented in a colorful catalog available from the Allison Co. Also described are the various cutting methods such as wet, dry and submerged.
Circle Inform-A-Gram No. E14.

DIEING MACHINES

Engineered for both high speed and long die life, Henry & Wright dieing machines have 7 distinct advantages. You can learn of these features in the illustrated and diagrammatic brochure now available.
Circle Inform-A-Gram No. E15.

OPTICAL COMPARATORS

Pertinent facts on the basic comparator principle is one of the many features of Jones & Lamson's Catalog 402-A on optical comparators. Also discussed are the developments in this field made by J & L in recent years.
Circle Inform-A-Gram No. E16.

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Here are some of the feature articles that have recently appeared in Tooling and Production.

"Producing Holes in Large Parts by Multiple Drilling Equipment"

"Standard Units and Air Feeds Speed Up Drilling and Tapping"

"Good Broach Design"

"Know Your High Velocity Band Tools"

"Diamond Sludge Recovery"

"How to Select Precision Switches"

"How to Run a Production Test of Metal Abrasives"

"Controlling Visual Characteristics on Precision Parts"

"Quality Level Certification"

"Quality Control of Involute Splines"

"Automatic Loaders for Crankshaft Lathes"

"An Unusual Dial Press Operation"

"Automatic Cycling of Machine Tool Operations"

"Electronic Production Control . . . As a Means to Cost Reduction"

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CIRCLE INFORM-A-GRAM KEY NO. 66.1

Pictorial Handbook on Steel Treating Now Is Available

Announcement of a new pictorial handbook on scientific steel treating services for industry has been made. The new brochure illustrates the latest steel treating devices, methods and applications both pictorially and through its text.

Types of treatment described in the brochure are flame hardening, induction hardening, heat treating, caronitriding, nitriding, liquid, gas and pack carburizing, chapmanizing, cyaniding, bar stock treating and straightening, normalizing, annealing and stress relieving, shot or sand blasting, and inspection and testing. A hardness conversion table is also included.

Standard 8½ x 11″ file size, this new handbook should prove a convenient source of information on steel improvement. Copies can be obtained without charge by writing The Lakeside Steel Improvement Co., 5418 Lakeside Avenue, Cleveland 14, Ohio.

Inform-A-Gram Key No. I1.

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CIRCLE INFORM-A-GRAM KEY NO. 66.2

Design Cover Goggles for Modern Large-Frame Prescription Glasses

American Industrial Safety Equipment Co. announces a new cover goggle specifically designed to fit over modern large-frame prescription glasses. Ventilation has been greatly improved and area of vision increased by this new 22% larger design, yet weight has been kept to a minimum by the use of light, strong plastics.

EyeGard Imperial Cover Goggles use standard 50mm round lenses and have aluminum rims and side shields.

Welders' Cover Goggles have baffled side shields to eliminate light and glare and are furnished with Federal Specification glare filter lenses.

Chippers' and Grinders' Cover Goggles have perforated side shields to provide increased ventilation and are furnished with clear lenses.

For literature concerning the new EyeGard Imperial Cover Goggles, write to American Industrial Safety Equipment Co., Lakeside Avenue, Cleveland 14, Ohio.

Inform-A-Gram Key No. I2.

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HEAVY JOBBING MACHINE SHOP—METALIZING

CIRCLE INFORM-A-GRAM KEY NO. 66.3

"When and How" Are Top Problems In Machinery Buying

Industry's real problems in replacing machinery and equipment are when and how to buy, rather than what to buy, the president of the nation's largest industrial financing firm has asserted.

According to S. D. Maddock, president of C. I. T. Corporation, replacement too long deferred creates too great a gap between installed capacity and capacity which would be possible with new machinery. However, replacements made too soon are uneconomical since technological advances in machinery over a short period of time are minor.

"Industry must decide when replacement is economically justified and when failure to replace machinery would weaken competitive standing."

"When the decision is made to replace old machinery or to expand or modernize facilities and equipment, it is important that management decide how to finance the program without impairing working capital. When a program is considered which would strain current funds, the practical answer to the problem is to use outside capital which can be repaid over a period of time. The most desirable solution is a funding plan which would leave working capital liquid and permit machinery to pay for itself out of increased earning capacity.

"In general, industry has available three sources of credit: a short-term bank loan; limited credit from several machinery and equipment makers; or a term-loan from an industrial financing company.

"Usually, the first source is used for short-term working capital loans rather than equipment loans. The second source, credit from manufacturers or distributors, is generally used when equipment purchases are made in limited amounts.

"For major expenditures, the best arrangement is an equipment-funding loan from a firm which specializes in industry financing. Terms can be geared to the borrower's income and tailored precisely to his needs.

"An advantage in this arrangement, is that a firm can make a number of purchases from several different sources and combine them all into one obligation which can be retired through a series of monthly payments. When notice is received from the various suppliers that the purchases are ready for delivery or have been installed, a check from the financing firm concludes each purchase.

"Term loans from the industrial financing company, do not interfere in any way with management, which has unhampered use of additional funds while keeping working capital free for current uses."

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CIRCLE INFORM-A-GRAM KEY NO. 66.5

Officers Elected at PMI Annual Meeting

Samuel P. Hull, Vice President of the Worchester Stamped Metal Company of Worchester, Massachusetts was elected President of the Pressed Metal Institute at its 10th Anniversary Meeting in Philadelphia October 7th through October 10th.

Elected Vice President of the Institute was James M. Leake, President of The Leake Stamping Company, Monroe, Michigan while Hunter Morrison, Jr., Vice President of Morrison Products, Inc., Cleveland, Ohio was elected Secretary-Treasurer for his third consecutive term.

Directors of the Institute elected during the convention which was attended by representatives from stamping companies from coast to coast and Canada:

H. E. Berry, Thomas Smith Company, Worcester, Mass; R. W. Blackman, Blackman Stamping & Mfg. Co., Los Angeles, Calif.; L. E. Dail, Dail Steel Products Company, Lansing, Mich.; W. R. Fischer, Peters Stamping Company, Perrysburg, Ohio; K. A. Honroth, Freeway Washer & Stamping Co., Cleveland, Ohio; H. P. Hopp, H. K. Metal Craft Mfg. Co., New York, N. Y.; Ray Howland, Eastern Tool & Stamping Co., Saugus, Mass.; E. A. Irwin, E. W. Bliss Company, Canton, Ohio; Bruce Krasberg, R. Krasberg & Sons Mfg. Co., Chicago, Ill.; W. K. Lomason, Douglas & Lomason Company, Detroit, Mich.; Sam Morrison, Morrison Steel Products, Inc., Buffalo, N. Y.; E. T. Nolan, Advance Stamping Co., Detroit, Mich.; W. J. Primrose, Jr., The Dickey-Grabler Company, Cleveland, Ohio; C. Glenwood Rose, Judson & Rose, Inc., Philadelphia, Pa.; George N. Schramm, United States Steel Corp., Pittsburgh, Pa.; C. E. Stryker, Maysteel Products, Inc., Milwaukee, Wis.; Norman R. Thal, Inshield Die & Stamping Co., Toledo, Ohio; and Melvin Verson, Verson Allsteel Press Company, Chicago, Ill.

Frank Humberger, President of Technical Metal Processing, Inc. of Cleveland, Ohio was elected Chairman of PMI's Associate Members, and John F. Lott, Vice President of Federated Steel Corporation, Pittsburgh, Pennsylvania was elected Vice Chairman.

Highlights of the convention included a panel discussion on "Wage Incentives" moderated by Orrin B. Werntz (Managing Director of PMI) and featuring C. W. Cederberg, Treasurer of Larson Tool & Stamping Company, Attleboro, Massachusetts; J. W. Gulliksen, General Superintendent of Worcester Pressed Steel Company, Worcester, Massachusetts; W. K. Lomason, President of Douglas & Lomason Company, Detroit, Michigan; and P. C. Wood, Assistant to the Vice President in Charge of Manufacturing of the Acklin Stamping Company, Toledo, Ohio.

The first trade association for the metal stamping industry was formed during World War I in 1918; and the successor, Pressed Metal Institute was incorporated as a non-profit organization under the laws of the State of Ohio in 1943; and now includes in its international membership companies from coast-to-coast and also England and Canada. The industry is well known for its engineering ability and volume production of pressed, stamped and drawn metal parts.

Certificates of Merit, which are PMI's highest honor, were presented during the banquet to retiring President, Wallace F. Ardussi, President of Variety Machine & Stamping Company, Cleveland, Ohio for his work in promoting and advancing the Pressed Metal Institute; and C. O. Rainey, Secretary-Treasurer of Morrison Steel Products, Inc., Buffalo, New York for his services in the preparation, presentation and distribution of the industry's first Cost Control Manual and for his services as Chairman of PMI's Committee on Statistics.

At this Tenth Anniversary Meeting, announcement was made of the appointment of R. W. Breckenridge as Technical Director to head PMI's new technical and engineering department.

Headquarters of the Pressed Metal Institute are at 2860 East 130th Street, Cleveland, Ohio; and Managing Director of the Institute is Orrin B. Werntz, and E. M. Ross is Assistant Manager.

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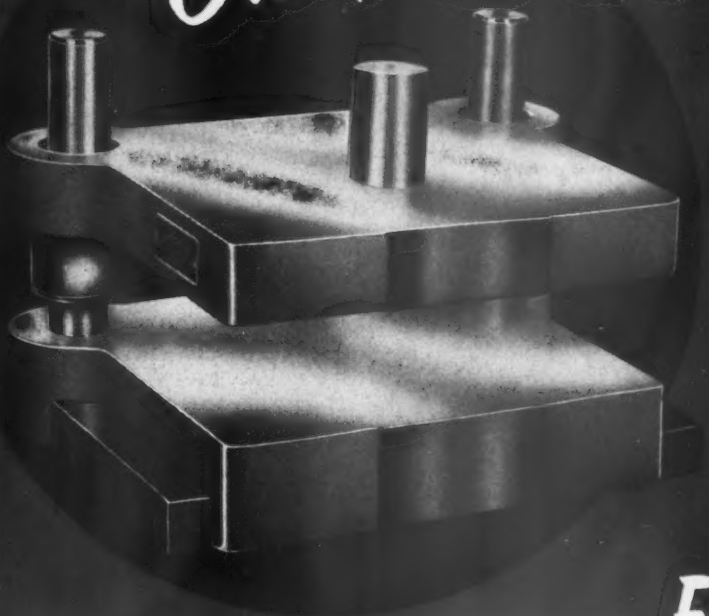
CIRCLE INFORM-A-GRAM KEY NO. 66.6

Only SUPERIOR PRECISION—ALL STEEL DIE SETS Give You These 3 Features For Safer Faster Handling



1 SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. *There is no extra charge for this valuable safety feature.*

2 LOCK JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

3 E-Z LIFT SLING CHAIN

is especially designed to fit the safety flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs. Nor is there danger of distorting stresses being set up in the die or set because of improper lifting.

It's no longer necessary to take needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers, ruin costly dies in process or completed, or even damage press equipment. Safety features of Superior die sets have eliminated all of these dangers and have speeded up the overall handling of sets from the bench to the press. Prove to yourself the merits of these safety features in both small and large die sets.

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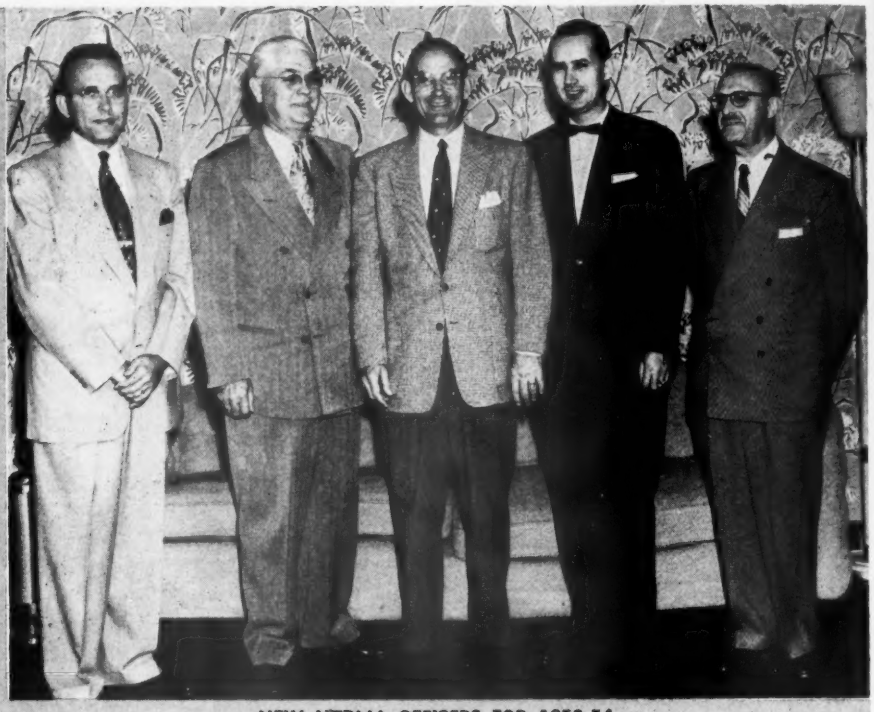
NEWS of the NTDMA 1953 ANNUAL MEETING



NEW NTDMA OFFICERS FOR 1953-54

(Left to right) Philip R. Marsilius, vice president of The Producto Machine Co., Bridgeport, Conn., Treasurer (re-elected); Joseph N. Huser, president of B & H Specialty Co., Inc., Indianapolis, Second Vice President; Herbert C. Murrer, president of Murrer Tool Co., Inc., Cincinnati, President; Jerome H. Stanek, vice president of Stanek Tool & Manufacturing Co., Milwaukee, First Vice President; and Albert Goldman, vice president of Atlantic Manufacturing Co., Philadelphia, Secretary.

Are we again wrecking the Army by cutting expenditures too far? John Slezak, Assistant Secretary of the Army for Materiel, answered this question with an unqualified "no" in his address on "The Army and Special Tooling" before approximately 200 executives of the National Tool and Die Manufacturers Association at its eighth annual meeting in Asbury Park, N. J. On the contrary, he said, we are maintaining and in some cases even improving our combat readiness.

"The fact that we are storing productive equipment," Mr. Slezak declared, "does not mean that the Government is going to stop buying machinery or tools. Tools and dies will be bought for stand-by plans as well as for current production. I believe these procurement programs will help to prevent your vital industry from falling into dark days as has happened in the past."

Mr. Slezak divided the nation's stand-by capacity into the following three categories:

1) Entire factories for the production of complicated, long lead time items—held intact for production readiness.

2) Where an entire plant cannot be mothballed, a "package" of machines and their tools kept together in the same plant or a nearby warehouse.

3) Stand-by equipment kept in central storage depots.

Until the advent of the new administration, Mr. Slezak said, our entire defense readiness was based upon the "static M-Day concept"—a probable date by which time the necessary mobilization reserved should be built up. "Under this plan," he stated, "we would proceed with full steam ahead to acquire the supplies required. However, if we did not go to war on that date and if we acquired the supplies required . . . we would stop all buying, disband the production capacity and wait in a stand-by condition for something to happen . . . it was expensive and it did not give us the defense readiness . . ."

"Under the new administration, Mr. Slezak went on to say, "Instead of rushing toward meeting our mobilization reserve stock by a certain date and then go out of business, we try to keep the maximum number of organizations in production, and since this reduces the time required to reach full production required under the assumed war conditions, we maintain our defense readiness with a much smaller amount of material on hand . . . at much lower cost to the nation."

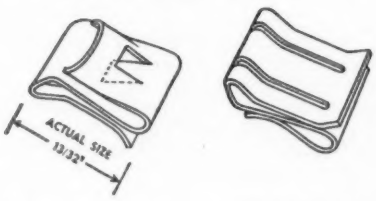
★ ★ ★

The prospective customer is not interested in the product itself but in what it will do for him, H. B. Sharer, Sales Training Specialist, U. S. Rubber Company, New York City, told the tool and die manufacturers. Mr. Sharer emphasized that good salesmanship consists of demonstrating what the product can do for the prospect—user-benefits—rather than extolling its quality. All that a salesman really has to sell to his customers, he added, is his product, his company and himself.

In another address before the tool and die group, Allen R.

. . . *Continued on page 109*

Produce Formed Stampings without Secondary Handlings with U. S. MULTI-SLIDES®



The sequence of operations for the part illustrated is as follows:

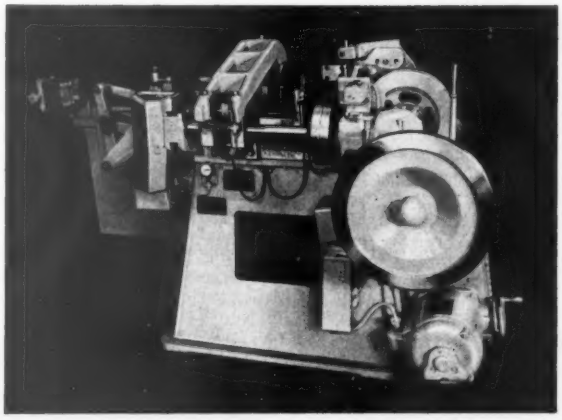
1. Pierce, shear and emboss in die head.
2. Cut-off blank from strip, using cut-off slide.
3. Preform around movable and stationary form posts.
4. Finish form around stationary form post, with movable form post withdrawn.

The small electrical part shown in the drawing above is produced from .018" x 5/16" copper in coils at the rate of 125 pieces per minute in a No. 28 U. S. Multi-Slide® similar to the machine shown in the photograph below.

Material of the exact width required is fed into the machine, thus eliminating trimming on the edges. No pilots are used in the dies, because of the accuracy of the feed unit. The feed pulls the material through a flat stock straightener and then pushes it into the dies the exact pitch required. A positive stop prevents any backward slippage of material.

The U. S. Multi-Slide produces parts of uniform accuracy, which naturally reduces spoilage and also results in saving time and labor where the parts are to be assembled in a larger unit. In the die head of the machine such operations as trimming, piercing, shearing, embossing or swaging may be performed; forming being handled by means of tools mounted on the forming slides.

Bulletin No. 15-P contains complete specifications for U. S. Multi-Slide Machines. May we send you a copy?



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U S PRODUCTS

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 69

Use postage-free Inform-A-Gram Key Number Card for your request

Cutting & Grinding Fluid Selector. This unique selector helps determine which cutting fluids can be used for various machine operations. Recommended fluids are those which have been found to be most suitable under average job condi-

tions. Every common machining operation for steel, stainless steel, magnesium, brass, bronze, copper, aluminum and monel is given. Instructions, plus rule of thumb to follow for using Stuart cutting and grinding fluids, also included. Write to D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.
Circle Inform-A-Gram No. C1.

Welding of Nickel Alloy Steels. A study of the various welding techniques, including some of the newer inert gas processes, electrodes, preheat treatments and post heat treatments, is presented in this 44-page booklet. Typical results that can be expected for the low alloy high strength steels, low carbon and medium carbon engineering alloy steels and special steels are given. Write to International Nickel, 67 Wall St., New York 5, N. Y., for Bulletin A-93.
Circle Inform-A-Gram No. C2.

Electrolytic Iron Powder Parts. Actual production facts about mechanical parts fabricated from electrolytic iron powder by the National Cash Register Co. are described in this 28-page booklet. Product designers or plant engineers will find this reprint of a paper presented at a recent meeting of the Metal Powder Association invaluable. The booklet has just been released by the Plastic Metals Division of the National Radiator Co., Johnstown, Pa.
Circle Inform-A-Gram No. C3.

Cut-Off Wheels. Here is a 36-page instructive manual giving information on various types of cutting-off machines and abrasive cut-off wheels, their selection, application and proper usage; also photographs of typical cutting-off operations, plus various helpful tables for wheel selection and conversion of wheel speeds to feet per minute values. Although this is a revised edition, it contains much data that is completely new and up to date. This booklet may be obtained by writing to the Norton Co., Worcester 6, Mass.
Circle Inform-A-Gram No. C4.

"Grinding Cemented Carbides." Amply illustrated with diagrams and photographs, this 39-page booklet reveals new techniques and abrasive products developed to obtain efficient and economical carbide tool manufacture and maintenance. Of particular interest are the objective appraisals concerning the advantages and limitations of the use of green grit and diamond grinding wheels. Wheel recommendations covering many specific grinding applications are also included. Write to the Carborundum Co., Niagara Falls, N. Y.
Circle Inform-A-Gram No. C5.

J.I.C. Standards. Two revised and up-to-date pamphlets on J.I.C. hydraulic and pneumatic standards for industrial equipment are available from the Miller Motor Co., 2040 N. Hawthorne Ave., Melrose Park, Ill. Miller also presents data on how its hydraulic and pneumatic cylinders meet the J.I.C. specifications.
Circle Inform-A-Gram No. C6.

"Rod Selector Chart." A new wall chart of welding rods, 22" x 34", printed in three colors and arranged for ready reference to assist in the selection of the proper welding alloy for specific jobs, is now available from the Eutectic Welding Alloys Corp., (Dept. "P"), Flushing, N. Y. The chart lists over 160 different Eutectic "Low Temperature Welding Alloys," their bonding points, tip colors, tensile strengths, etc., classified by type of metal and further subdivided by arc or torch applications.
Circle Inform-A-Gram No. C7.

"The Facts of Life on Air and Hydraulic Devices." In this little book, the Logansport Machine Co., Logansport, Ind., presents some pertinent "Do's and Don'ts" in order that users may obtain the maximum performance from Logan Air and Hydraulic equipment. Covered in the booklet are such units as hydraulic valves, fluid lines, cylinders, and checking equipment. Several diagrams of hydraulic units add to the informative nature of this popular manual.
Circle Inform-A-Gram No. C8.

Drill Rods. Sizes, weights and decimal equivalents are presented in a chart now being offered by the Pittsburgh Tool Steel Wire Co., Monaca, Pa. Very handy for the tool room, stock room or warehouse, the chart also contains typical uses for "Pittsburgh" drill rods and cold finished steels.
Circle Inform-A-Gram No. C9.

"Meehanite Metal As A Gear Material" is the title of a new 36-page book known as Bulletin No. 42 published by the Meehanite Metal

Corp., New Rochelle, N. Y. This booklet describes and illustrates many Meehanite gear applications and goes into considerable detail on the subject of gear casting design. It also provides engineering properties of both types of Meehanite metal used in gearing and other gear materials. To obtain your copy of this book write direct to the company or
Circle Inform-A-Gram Key No. C10.

GORTON *Brings You* High Production

Automatic Profiling of CAMS AND CAM-LIKE SHAPES

Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

CAPACITY . . .

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

EXTREME ACCURACY . . .

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

CUSTOM-DESIGNED . . .

The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2390-C- 1212

GEORGE GORTON MACHINE CO.

1212 RACINE STREET • RACINE, WISCONSIN, U. S. A.

CIRCLE INFORM-A-GRAM KEY No. 71

BARNES FAMOUS FOR QUALITY

BARNES Band Saws

HARD EDGE • FLEXIBLE BACK

ARC LINE
RAKER SET

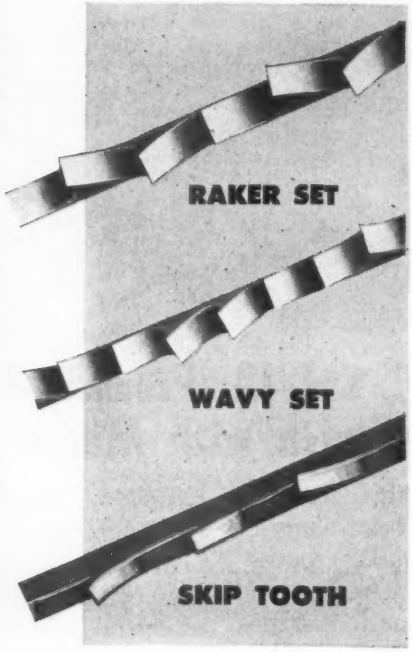
Preferred for cutting larger solids or thick plate—assures fast cutting rate. Arc Line Raker Set retains the saw kerf. For contour cutting, Arc Line Raker Set permits cutting dies and intricate shapes to a layout line within close tolerances. On cut-off operations, Arc Line Raker Set is used on large stock. It resists wear and gives longer blade life.

ARC LINE
WAVY SET

Arc Line Wavy Set eliminates stripping when cutting thin sections, such as structural shapes, tubing, pipes, sheet stock, etc. Used on all horizontal and vertical machines, such as Johnson, Kalamazoo, Wells, DoAll, Grob, Tannewitz, and others. Arc Line Wavy Set is preferred by foundries for removing gates and risers where fins are encountered.

BARNES
SKIP TOOTH

Barnes Skip Tooth is used for cutting nonferrous metals, plastics, paper, wood, rubber, etc. The special tooth design provides maximum chip clearance, cuts faster and easier. Aluminum and magnesium foundries prefer Barnes Skip Tooth. Woodworkers use it because it resists dulling due to glue and nails. No resharpening is necessary. Lasts longer. The hardened teeth retain keen cutting edge. Designed for high speed cutting.



BARNES WELDED BAND SAWS are SUPERIOR!

Barnes Welded Bands save operator time and eliminate waste blade stock. They are tailor made for specific sawing machines. Time saved increases production. Barnes assures a "perfect" weld on a superior blade. It all adds up to more cuts at less cost.

BARNES PACKAGING is DESIGNED for YOUR Convenience

Packaged 3 ways!

1. **100 ft. Coils**—Easily handled. Safe, convenient to store, free from tangle. Saw is coiled to readily unwind as well as rewind. No projecting ends.
2. **250-500 ft.**—Economical random length coils. Provide greater economy and minimize waste.
3. **Welded Bands**—Perfectly welded to desired length. Packaged 6-10-12 to carton as requested.

Call YOUR INDUSTRIAL DISTRIBUTOR

W. O. Barnes CO., INC.

FAMOUS FOR QUALITY • 1297 TERMINAL AVE., DETROIT 14, MICH. • ESTABLISHED 1919

CIRCLE INFORM-A-GRAM KEY NO. 72

★ ★ ★ ★ ★ ★ ★ ★ ★

as we go to press

★ ★ ★ ★ ★ ★ ★ ★ ★

The Proper Handling of Parts in metal-working plants is a vital factor in increasing productivity, stepping up quality and reducing costs. Rolock, Inc., is a concern which specializes in the design and fabrication of equipment for the expeditious and safe handling of parts in process. Rolock equipment is fabricated from heat and corrosion resistant alloys so that it will withstand the high temperatures and corrosive acids involved in many metal-working and finishing operations.

Rolock's services in this field are covered by two catalog sections. One, No. B-9 the "Corrosion Resistant Section" shows over 100 baskets, crates, racks, tanks, sinks, shell case equipment, and "George", Rolock's "almost automatic" tote box truck.

The other, No. B-8, the "Heat Treating Section" has photos of 74 baskets, trays, racks, fixtures, muffles, and retorts.

A study of the varied designs which Rolock has built for others should aid you in solving comparable problems of your own.

The two catalog sections, No. B-9 and No. B-8 may be requested from Rolock, Inc., 1350 Kings Highway, Fairfield, Conn.

Circle Inform-A-Gram Key No. D1.

★ ★ ★

The Hartford Special Machinery Company, builders of automatic drilling and tapping machines, automatic thread rollers, and indexing devices, is offering a detailed and generously illustrated brochure covering their Contract Machine Division and Special Work Division.

Illustrations of special machines built for a great variety of major industries show the high degree of design and manufacturing skills which Hartford is able to apply to any project.

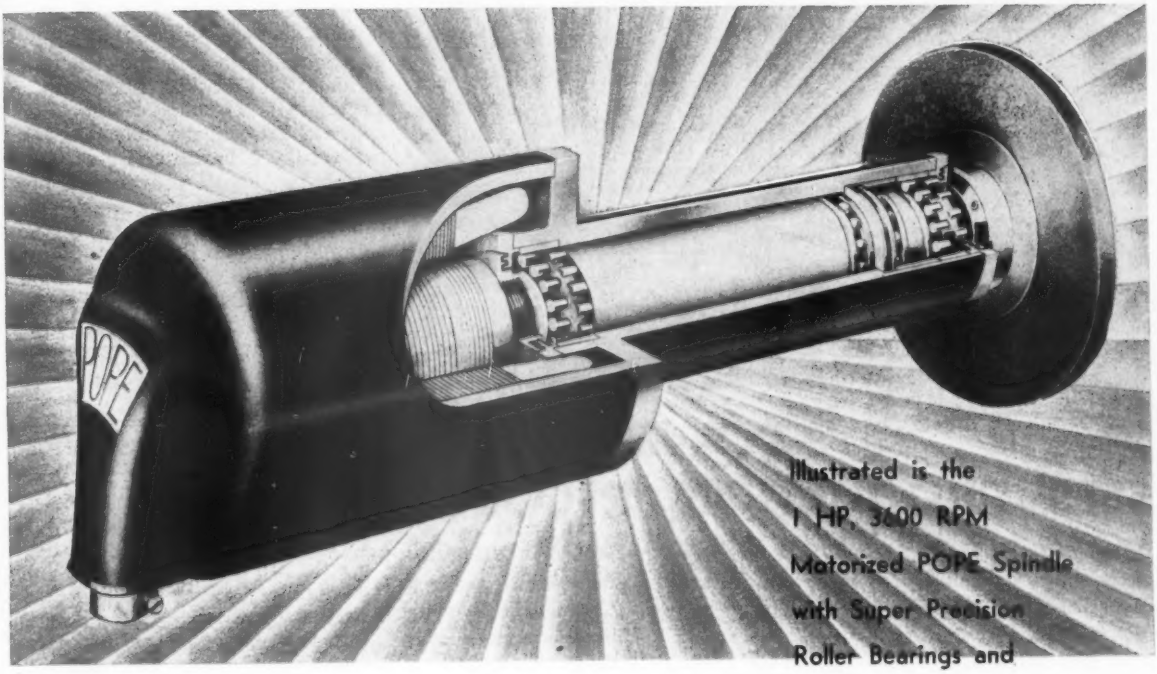
That portion of text and pictures devoted to Hartford's Contract Work Division shows a modern and well equipped manufacturing machine shop, backed up by full engineering services, more than adequate for the production of almost any type of parts, components or complete machines.

A copy of the 12-page "Hartford Special Facilities" brochure may be had upon request to The Hartford Special Machinery Company, Hartford 12, Conn.

Circle Inform-A-Gram Key No. D2.

. . . *Continued on page 76*

NOW! from BEARINGS, Inc. The POPE Precision Spindle!



Illustrated is the 1 HP, 3600 RPM Motorized POPE Spindle with Super Precision Roller Bearings and Separate Thrust Bearings

We are now an authorized stock-carrying distributor for this outstanding spindle . . . chosen because of our knowledge and long experience in maintenance and servicing all types of precision spindles. Our sales engineers are factory trained to advise you on the proper spindle for your work. Fill out and return the coupon below today.

Has tremendous load carrying capacity, producing a superior finish and gives long, trouble-free operation. Applicable to all new grinders and to those now in service!

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NEW JERSEY: Camden • **OHIO:** Akron • Canton • Cincinnati • Cleveland Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown Zanesville • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh Reading • York • **WEST VIRGINIA:** Charleston • Huntington • Wheeling

BEARINGS, Inc., 3634 Euclid Ave., Cleveland 15, O.

Gentlemen:

Please send me full information on the POPE SPINDLE. ☐

Send me your new spindle repair booklet. ☐

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MEMBER AFBDA

CIRCLE INFORM-A-GRAM KEY NO. 73

130,000,000 pieces
produced on one
PRESS-RITE POWER PRESS

Some of the Press-Rite Presses at
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Specialists in electronic parts for Cathode Ray Radar and Television Picture Tubes.

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SETS PRODUCTION RECORD!

In just *four* years, one PRESS-RITE Power Press has produced 130,000,000 pieces with a minimum of maintenance . . . and it is still going strong each day. The excellent performance of this press resulted in adding 35 more PRESS-RITE Presses from 5 to 30 ton capacity. The material used runs from .002 to .030 thick with ≠ .00025 tolerance and includes nickel, stainless steel, aluminum, brass, copper, Beryllium copper, titanium, kovar, rodar, tantalum, nickel silver and precious metals. Strip is fed into the press with a tolerance of ≠ .001.

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CIRCLE INFORM-A-GRAM KEY No. 74

Accident Prevention

People with emotional problems are high accident risks, according to Dr. Eleroy L. Stromberg, director of training and personnel research for The B. F. Goodrich Company. "This is true regardless of efforts to make conditions under which they work as safe as possible."

Speaking before the American Society of Safety Engineers at their 41st National Safety Congress in Chicago recently, Dr. Stromberg indicated that industry's accident prevention programs must devote more and more time to studying the emotional makeup of the individual worker. A healthy man without emotional disorder is the best industrial risk, while mentally and emotionally handicapped persons are greater liabilities than the physically handicapped.

BUY U. S. SAVINGS BONDS

"If it were possible to establish the same degree of safety in all working conditions, there would still be variations," Stromberg points out. Younger individuals would have more accidents, but they would be of a minor character. Older employees would have fewer accidents, but they would be more serious.

Individuals, in a great many cases, contribute most of the factors necessary to make an accident. They bring emotional factors such as fear, worry, unrest, illness, boredom, mental fatigue, anger, and irritability to the job. Many of these individuals could appropriately be called "accidents looking for a time and place to happen." In the accident field, the prevention of personal failure is the best means of reducing accident frequency.

Every foreman, supervisor, engineer, manager needs to recognize the human relations functions that are associated with safety. These include understanding the individual worker, recognizing signs and symptoms which characterize the pre-accident personality, and the planning of activity for those who need special safeguards at a particular time.

. . . Hardness Testing, from page 64

readings thus obtained is the letter B.

Since Rockwell hardness numbers bear no relationship whatever to the surface of the indentation, but are obtained directly by the testing device, depth of penetration is the only possible standard. This must be read from a dial on the machine, or by a suitable reading scale. Different types of instruments have been devised to give Rockwell readings.

One hardness tester giving measurements following the Rockwell method, on any type of metal in the Rockwell A through F scales by direct reading, makes use of a lever-arm, supported on knife edges, and projects a magnified image of the hardness reading on a screen. This optical balance maintains its calibration over extended time intervals, and is very accurate. Values are on the conventional scale, which are obtained with standard loads and penetrators. The optical system incorporated eliminates all dials and linkages which might introduce inaccuracies.

The B and C Rockwell scales appear to the observer at high magnification, and all loads are obtained by weights. These loads are interchanged automatically by means of an external knob. An interesting aspect of this particular tester, however, is that it also allows carrying out Brinell and Vickers tests if desired. In the case of Brinell or Vickers tests, the indentations must be measured afterward, using a special microscope in order to read the corresponding hardness numbers.

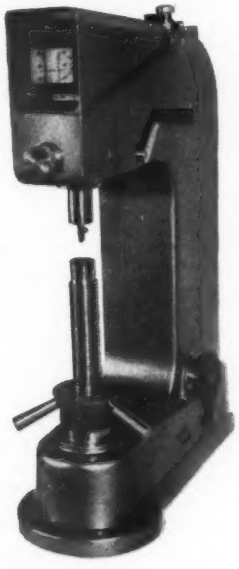


Fig. 2. This Rockwell hardness testing instrument provides hardness measurements on any type of metal. The readings appear directly on a dial, and the depth of penetration is projected directly on a screen. It can be used to carry out Brinell tests also, and can be used with a 30 kilogram load, for special tests and Vickers measurement.

Photo courtesy The Opplem Company.

Portable Screw-Action Testers

One very interesting line of portable hardness testers read directly in the Rockwell scales A, B, and C. They are equipped with both a diamond penetrator and a ball penetrator, which thread directly into the spindle. The smallest model of this type weighs only 1½ pounds and is suitable for testing rounds and flats up to one inch. Another model, weighing 2½ pounds, is equipped with two flat and two V anvils. It will test rounds and scales. A still larger model weighing 3¼ flats up to two inches in Rockwell A, B and C pounds is provided with adjustable extensions and anvils, and will test rounds and flats up to four inches in Rockwell A, B and C scales.

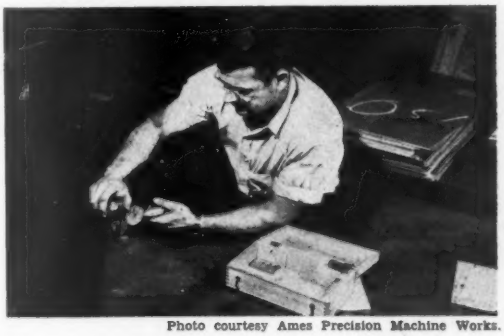


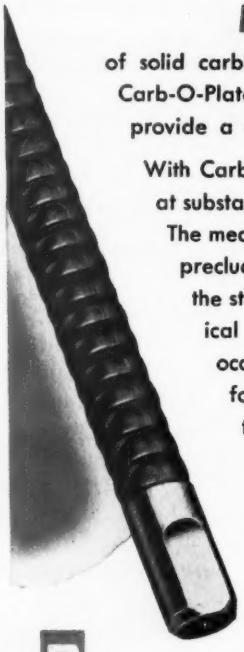
Photo courtesy Ames Precision Machine Works.

Fig. 3. An interesting view of a portable hardness tester in actual use. This is the type of instrument on which the load is applied by screw action, and on which the dial reading is a result of lever action derived from a springing action in the instrument frame.

These testers, being completely portable, are often used for testing long bars and large sheets where they are stocked without the necessity for cutting off samples. Thus, they save their cost many times over. Pressure loads on these instruments are applied to the penetrators by screw action, instead of weights and levers as found in large bench-type testers. The pressure required checked causes the frame of the instrument to spring open slightly. This action causes a lever on the front to actuate a dial indicator. Tests prove that such action remains uniform after millions of tests have been made.

Standard Rockwell testing machines are available in different models. One type found in many plants has eight inches vertical capacity, and between five and six inches

. . . Continued on page 78



Many gages, parts and tools normally produced of solid carbide can now be made with a steel base and Carb-O-Plated—a method which employs the Linde process to provide a thin wear-resistant coating of tungsten carbide.

With Carb-O-Plating you get the wear life of carbide but at substantially lower cost than if the solid material is used. The mechanical bond between the coating and steel base precludes change in properties or warping. Because of the steel base, the products have resistance to mechanical shock and are not subject to breakage as can occur with sintered carbide. In addition, when used for gages, Carb-O-Plating increases accuracy since thermal expansion and contraction is identical to the steel part being gaged.

Many of the country's foremost manufacturers are now benefiting from the use of Lincoln Park's Carb-O-Plated products. Why not investigate the application of this new process to your wear-resistant parts.

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE, LINCOLN PARK 25, MICH.

DESIGNERS AND MANUFACTURERS OF: SPECIAL AND STANDARD CARBIDE CHROME PLATED AND STEEL GAGES CARBIDE ROTARY FILES • ALSO FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

CIRCLE INFORM-A-GRAM KEY NO. 76

. . . Go To Press, from page 72

Progressive Die Case Histories are pictorially presented in a catalog entitled, "B. Jahn Production Proved Dies". It is built around the progress of the B. Jahn Manufacturing Company from a three man die shop in 1911 to one of today's largest and best equipped die making enterprises.

The catalog pictures the test-running of dies and gives many examples of work from progressive dies ranging from 5 to 13 stations.

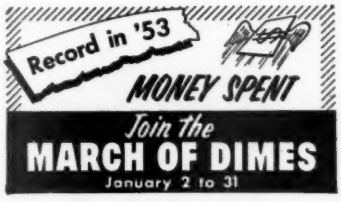
Several pages are devoted to the modern toolmaking and inspection equipment that is at the disposal of B. Jahn's staff of 165 toolmakers.

The B. Jahn Manufacturing Company, of New Britain, Conn., will be glad to send you a copy of "The Story of B. Jahn Production Proved Dies".

Circle Inform-A-Gram Key No. D3.

★ ★ ★

Pratt & Whitney's Keller Machine, Type BG-21, is built specifically for tracer-controlled milling, and will accurately reproduce the shape of any 2-dimensional template or 3-dimensional full model. It delivers

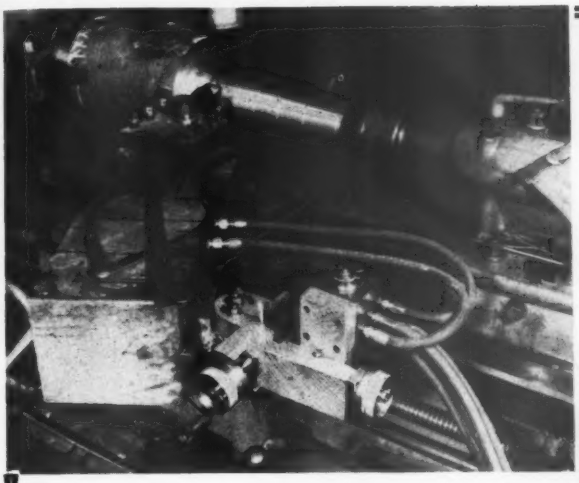


rapid and economical production of dies, molds, and any other workpieces having irregular shapes or complex geometrical curves that cannot conveniently be machined by other methods.

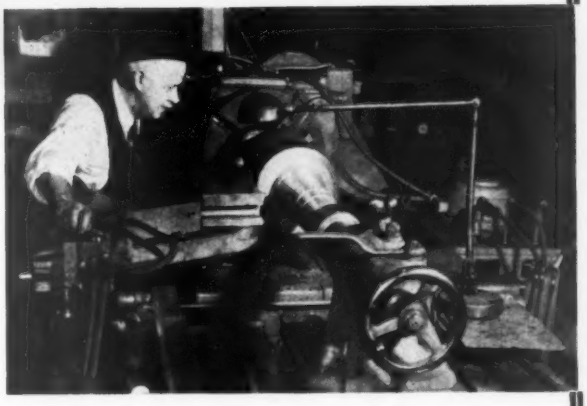
The new machine is patterned after their giant Keller, Type BG-22, and although scaled down in dimension and capacity, it is an entirely new design and incorporates many important new features. Special attention has been given to the simplification of work loading and work holding. To attain an increased output of smaller-than-maximum-size workpieces, the BG-21 is also available as a 2-spindle model which will produce two duplicate jobs simultaneously from a single master. The machines with a horizontal capacity of 6 feet or more feature automatic chip disposal.

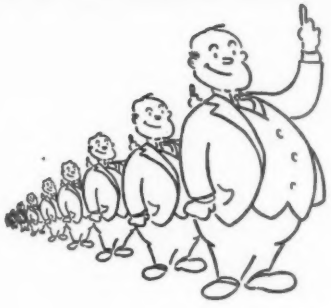
A 12 page catalog containing detailed descriptions, specifications and illustrations of the Keller BG-21 may be had by addressing Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford 1, Conn.

Circle Inform-A-Gram Key No. D4.



TRACER CONTROLLED MACHINING APPLIED TO ANY LATHE FOR THE TURNING OF NECKS ON ROLLS FOR STEEL MILLS





Mr. Duplicator

MR. DUPLICATOR SAYS—"Walker, in my visits to Steel Mills I am dismayed by the lack of tracer controlled machining. Can't you do something about it?"

WALKER SAYS—"Yes, Mr. Duplicator, we are doing something about it." Two well known manufacturers of Roll Lathes will soon make such an announcement. We are slowly proving to the Steel Mills the worth of tracer controlled machining. The photos show a 30" Monarch equipped with our Universal Step Turning Duplicator turning roll necks. Roll turning can be completed on this lathe.

Please note that we do not cut down the swing or the cross slide. All controls and templates are in front, so no need to go behind the lathe for anything. All measuring and adjusting is done in front.

Please note that no mirrors, periscopes, clutches or electronic devices are used—just simple hydraulics applied to the lathe already in your shop.

WALKER DUPLICATORS are turning rolls, boring odd shapes, milling uneven surfaces, and are even applied to grinders and planers. There are very few jobs that can't be done to greater advantage with the aid of our duplicators . . . we can help you with your machining problems.

We can furnish a thorough and understandable solution to your Duplicating problems. Send us a print of the part to be made, along with the make and size of machine to be modernized, and we will give you recommendations and firm quotation.

REPRESENTATIVES IN PRINCIPAL AREAS

Walker HYDRAULIC DUPLICATOR CO.

P. O. Box 461 STANDISH, MICHIGAN

Pioneer Designers and Builders of Precision Duplicating Equipment

CIRCLE INFORM-A-GRAM KEY NO. 77

. . . Hardness Testing, from page 75

horizontal reach. Another model, very compact, is used entirely for testing small parts. It is used by many mills when rolling sheet metal stock which has sufficient thickness to be consistently tested with a standard Rock-

Photo courtesy Newage International, Inc.

Fig. 4. This direct dial reading tester will test the hardness of any size, shape and type of metal. In its operation the tester is applied to the material to be tested by pushing downward on the handgrips and the measurement is then read directly on the dial.

well unit. A taller-than-ordinary machine is available, which has a vertical gap of 12 inches, and a still taller model may be obtained, having a vertical gap of 16 inches.

These testers incorporate a dashpot for speed control of load application. It is important, particularly where diamond penetrators are being employed, not to allow an unrestrained rate of load application, since it greatly increases breakage of penetrators. The dashpot in these machines is equipped with a variable-speed adjustment. Therefore speed may be adapted to the kind of material being tested. The harder the material being tested, the more gently it should be contacted by a penetrator.

Time-Saving Zeroizing Method Incorporated

A modern development on these machines is a supplemental scale which allows dial zeroizing during (instead of before) the period of major load application. This definitely saves time on quantity inspection testing. Under control of the dashpot mechanism, the load is applied by standardized weights through a lever. This lever operates on a knife edge fulcrum, and the plunger system is free-floating and frictionless.

Special work support accessories are provided with these machines when desired, for pieces of long overhang. Usually, these are in the form of a supporting arm, reaching out in the direction of work extension, and properly counterbalanced in the opposite direction. Where these are to be used, the elevating screw of the tester necessarily carries all the dead weight involved. When tubes, bars, or other shapes are very long or heavy, a so-called jack-rest is used. It supports the workpiece from the floor, at a distance somewhat removed from the hardness testing machine. In some cases, two jack-rests are used, one on each side of the testing machine.

A special motorized hardness tester of standard Rockwell type is available, which incorporates a special six-volt electromagnetic clutch in the drive shaft. This clutch responds to a switch, located at the front of the tester base, convenient to the operator. This power equipment performs the work which is ordinarily done by the operator on other machines, thereby standardizing the rate of load application. A suitable motor, with a cam, lowers and lifts the power lever to apply and withdraw the major load. A

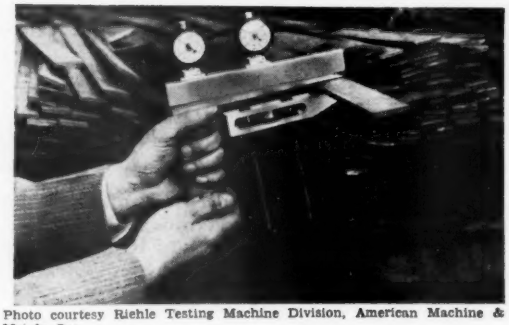


Photo courtesy Riehle Testing Machine Division, American Machine & Metals, Inc.

Fig. 5. Seen in use here is a portable hardness tester providing Rockwell readings on the A, B, and C scales, which has various uses through the metal-working industries. It is shown in use for hardness; inspection testing on flat bar stock in the receiving department.

bar runs horizontally across the front. The operator taps downward upon this bar, which closes the circuit that controls the load cycle.

Each of these machines is made for operation at two different speeds. An external gear shift is provided on the back of the pedestal. At fast speed, the cycle of major load operation is completed in 1¼ seconds. At slow speed, the cycle requires four seconds. Such machines are far less fatiguing for an operator doing inspection testing throughout the working day. Work at the end of the day is tested as rapidly as earlier

. . . *Continued on page 104*

ELGIN DIAMOND

meets rigid quality standards

at Allegheny Ludlum Steel Corporation, Pittsburgh

When wire is pulled through carbide dies, tremendous heat and pressure are generated. That is why the working surfaces of wire drawing dies must be polished to a near perfect finish. That is why Allegheny Ludlum uses Elgin Diamond.

Elgin Diamond assures the finest possible finish—and in less time—because all Elgin Diamond is precision graded and permanently suspended in a color-identified compound right in the Elgin laboratories. There are no oversize particles to scratch, no "fines" to decrease cutting efficiency.

Hundreds of die finishing applications prove Elgin Diamond reduces costs and produces a better finish every time . . . in less time! Now is the time to try Elgin Diamond and prove it to yourself!

Ask for a free demonstration!

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ELGIN NATIONAL WATCH COMPANY

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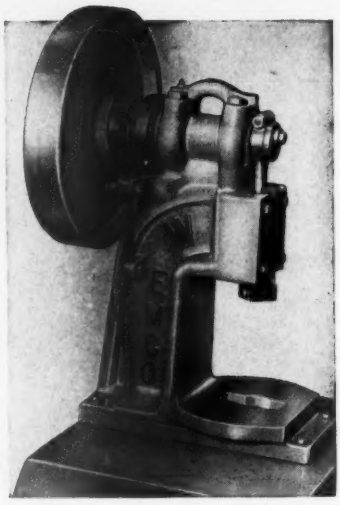

Emco "W", bench type. Also Emco "X" (larger size). Both sizes also stand-mounted. With or without motor drive.

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POWER PUNCH PRESSES are SPEEDY and SAFE

Versatile Emco "W" and "X" presses excel for punching, forming, stencilling and riveting metal, rubber, leather, plastics and other non-metallic materials. You get up to 300 operations per minute. Profit from big machine speed, strength, rigidity, accuracy and endurance. Compact, fool-proof (non-repeating), simple design—easy to understand and operate. Thousands of Emcos in money-making use testify to Klaas' dependability since 1921.

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Emco "W"—¾" 1" and 1¼" standard stroke
Emco "X"—1½" and 2" standard stroke
Specials to order

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Write on your letterhead for our Bulletin T-12

UNUSUAL AIDS TO INDUSTRY

THE KLAAS MACHINE & MFG. COMPANY
4312 East 49th Street
Cleveland 25, Ohio

KLAAS-BUILT

CIRCLE INFORM-A-GRAM KEY NO. 80

Ultrasonic Inspection Using Automatic Recording and Frequency Modulated Flaw Detection

INSPECTION of metal forgings, extrusions, or castings for internal defects requires that the operator be given complete information concerning size, position, and angle of internal flaws.

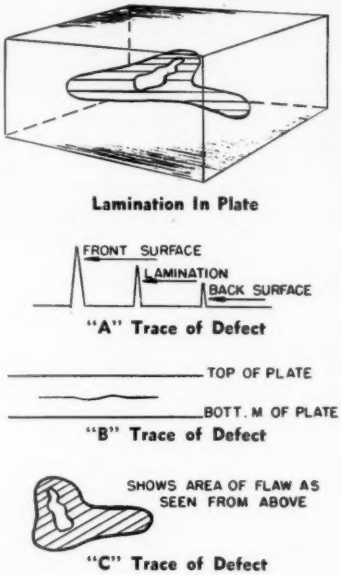
by Donald C. Erdman
President
ELECTRO CIRCUITS, INC.
Pasadena 1, California

If a hypothetical, ideal flaw detecting machine is to be designed, one faces a number of problems:

1. The metal being inspected must be inspected from all points of view. That is, the operator must cause the crystal to scan the metal from most surfaces in order to insure that the sonic beam has traversed the entire interior of the metal. This imposes a most difficult scanner design problem, and the problem of how one is to present the pictures formed when the data is gathered from all possible points of view. A fair-sized computer is necessary to correlate the information from the various views.

2. The ultrasonic beam diameter must be small in order to be able to define adequately the outline of a flaw. A small flaw can be detected with a large beam diameter; but the outline of the flaw cannot be drawn on the TV screen since there is no way of knowing whether the flaw was picked up from the edge of the beam, the middle, or off in one of the side lobes of the sonic beam. Small diameter sonic beams can be produced only at high ultrasonic frequencies due to the fact that the crystal face, or the collimating hole, must be a few wavelengths in diameter in order to produce a parallel beam of ultrasound.

3. The flaw detector should be capable of high resolution to indicate the depth of the flaw beneath the surface. The higher the frequency used for the flaw detection the better is depth resolution. It is unfortunate that suitable resolution requires frequencies that will not penetrate many types of steel forgings, nor will they penetrate iron or steel castings. An improvement in depth resolution without forcing the use of higher frequencies for inspection has been made by using the frequency modulated type of echo flaw detector.



4. Some form of permanent record of the flaw data is needed. It is important to avoid having tons of film to store. The ideal flaw detector should allow the operator to make a quick record of the defective area without seriously slowing down the routine inspection work. Although film is capable of recording more information, it has the great disadvantage of not showing the results until after development. Some direct recording method such as pen on paper, electrosensitive recording, heat sensitive paper, or a record placed on the metal being inspected is indicated.

Presentation of Flaw Data

Presentation of flaw data can be done in quite a number of ways. Most familiar is the "A"

. . . *Continued on page 114*

From a paper delivered before the 1953 Annual Convention of the Society for Nondestructive Testing, Inc., held at Cleveland in conjunction with the National Metal Congress and Exposition.

J. R. Fitzsimmons, Founder of Die Supply Company, discusses the features of a DIECO Die Set with J. H. Tredinnick, Bliss Executive Vice President; Warren Fitzsimmons, Plant Manager; and sales engineers at a recent meeting at the Company's plant in Cleveland.*

DIECO BLISS

DIE SUPPLY Joins E. W. BLISS

Your Die Supply Company representative has taken on new stature. He will continue to offer the best die sets and accessories available, backed by the efficient manufacturing and distributing organization on which you have learned to rely.

But this service is now enhanced by the facilities of the E. W. Bliss Company, world's largest builder of metalworking presses. The greatly increased manufacturing capacity made available to DIECO by this association means faster deliveries in busy times and larger die sets and bolster plates than previously offered.

Your Dieco representative will call on you shortly to tell you of other developments which will result in better service to you.

* Left to right: J. R. Fitzsimmons; Tredinnick; Warren Fitzsimmons; Ed Brumagin, Ed Buck and Bob Gayner (Cleveland); Bill Powell (Dayton); Donald Flynn (Buffalo); Louis Taber, Customer Service (Cleveland) and John Sacash, spring application engineer (Cleveland).

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CIRCLE INFORM-A-GRAM KEY NO. 81

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by Gordon B. Thayer

Tells how to
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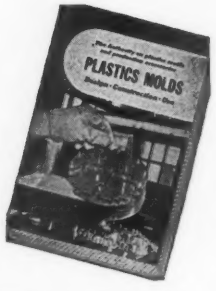
PLASTICS MOLDS



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CIRCLE INFORM-A-GRAM KEY No. 82

Disaster Cooperation*

The Livonia fire that destroyed the Detroit Hydromatic Plant of General Motors on August 12 gave rise to one of the most remarkable examples of disaster cooperation in American industrial history.

Long before the ashes were cold, General Motors had machine tool builders on the long distance telephone. Each company was asked what it could do toward salvaging machines of its own make.

Over 2700 fire damaged machines were shipped for rehabilitation to 296 machine tool builders and rebuilders, and 19 General Motors Divisions, in 87 cities in 17 states. Following are abbreviated reports of what happened in machine tool plants:

"As soon as we got word we cleared out a whole section of the shop and put everything it contained into storage. We held a foremen's meeting, stole a few men from each department, and had a special salvage division all set up before the first machines came in.

"The first machines arrived within a week after the fire. We got a total of 25. They were completely dismantled, sand blasted, and rebuilt. The worst problem was special fixtures. However, except for the tooling, some are now ready to go back. We'll be shipping them shortly. Others will follow rapidly."

★ ★ ★

"We were lucky. We had just moved out of an old plant into a new one. So there was space available in the old plant. That's where we set up a Livonia Department.

"We got in two machines within a few days after the fire, stripped them down, found out what had to be done, and got ready for the rest. Thirty-eight came back. We were able to rebuild 31. Seven had to be scrapped.

"Cracked bases were welded and brazed, and then scraped and planed like new iron. All electrical equipment was a molten mass and had to be replaced. Wheel spindles could be saved, but bronze bearings were gone. Major castings where hardness was not a critical factor were salvaged.

"We have already returned some machines to Detroit."

★ ★ ★

"Four days after the fire a committee of our executives and supervisors visited Livonia to survey the situation. The next day machines began to arrive at our plant at the rate of 10 a day. We finally had

*From "Machine Tool Progress", Vol. 2 No. 3, published by The National Machine Tool Builders' Association.

over 100. Over 90% have been, or will be, rebuilt.

"The first difficulty was to clean the machines so they could be inspected and dismantled. The worst trouble was that tar from the roof had fused to many of the machines. Working with a strong solvent and a steam hose was too slow. Sand blasting was the answer. To supplement our equipment we borrowed a sand blast machine from an abandoned foundry.

"Every rebuilt machine was given the same alignment accuracy tests as a new machine. Some of them are already back in Detroit.

★ ★ ★

"Twelve machines came in four days after the fire. They were pretty badly shot. We had to tear them down to see what had to be done. Then we went at it—overtime and Sundays.

"We had some other automobile customers but they said, 'Our stuff can wait. Take care of this fire job.'

"These 12 machines will be back in Detroit the 10th of November."

★ ★ ★

"We had both standard and special machines of our manufacture in the Livonia plant. The special machines are big ones. Our assembly floor was covered with work normally in process. What to do was a problem.

"Here is how we worked it out. When our standard machines came back—45 of them—we turned them over to another machine tool builder whose plant is near ours, and they undertook the job of rebuilding and reconditioning under supervision.

"Meanwhile in our own plant we tackled the special machines. We had to get after the suppliers of components entering into the machines and speed them up. We used all our own supervisory facilities, and got in extra help from outside.

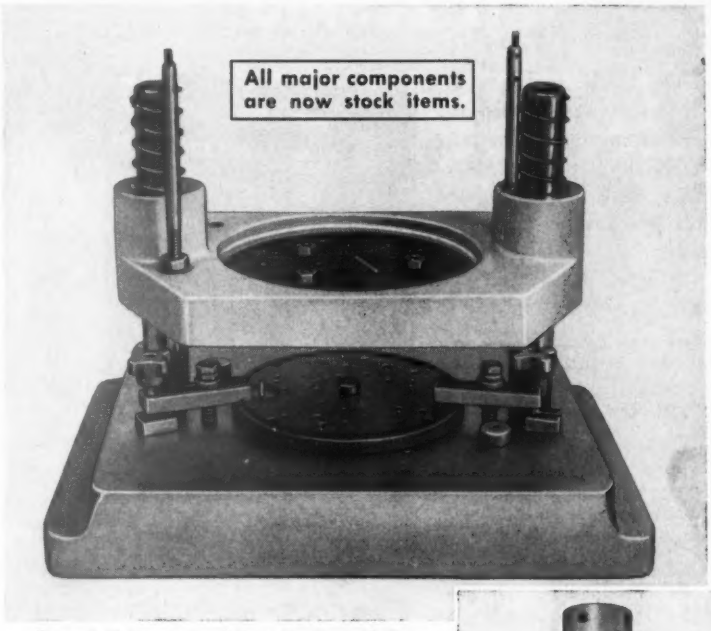
"The first special machine is a 40,000-pound job that normally takes six to eight weeks on the assembly floor alone. We had to clean it, tear it down, rebuild it, and assemble it. And we'll have it back in Detroit by the end of October."

★ ★ ★

These accounts are typical. Every machine tool company involved in the rebuilding program has the same story to tell.

The relationship between machine tool builders and machine tool users is not one of just buying and selling. Both are integral parts of America's great production system. The cooperation following the Livonia fire is an outstanding example of men working together to get things done. There was instant realization of the need for action.

HERE'S THE NEW Zagar
Standardized Self-Clamping DRILL JIG

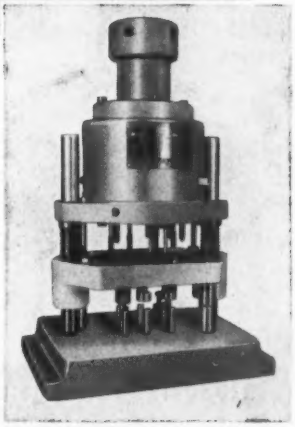


Zagar Drill Jigs are used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill and tap on standard drill presses and tapping machines.

NOTHING ELSE LIKE IT!

4 TYPES — 9 SIZES,
5 COMBINATIONS PER SIZE —
Hole Patterns 3" through 15" Dia.

SPEEDY — ACCURATE — RUGGED



▲ Zagar 15-spindle, 7" diameter gearless drill head mounted on Zagar standardized drill jig drills 15 holes in aircraft part.

A new concept to reach new production highs! Standardization means quick delivery and attractive price, since only a very few minor parts have to be made. Extremely fast; the operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Proven design insures maximum accuracy.

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY No. 83

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THE BEST WAY TO PUT SMALL ITEMS IN THEIR PLACE!

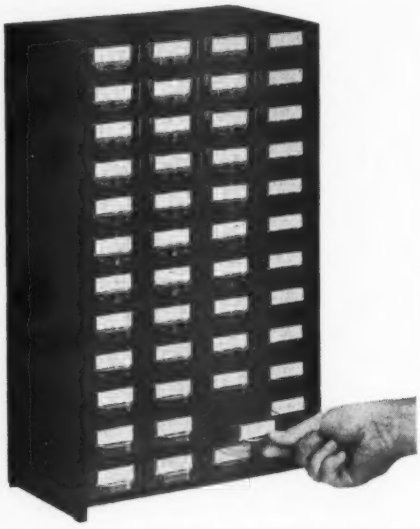
In every home, in every office, in every shop, there are dozens of small parts requiring easy, convenient storage. The slickest, handiest answer to this problem is the JIFFY Cabinet.

CHECK THESE FEATURES:

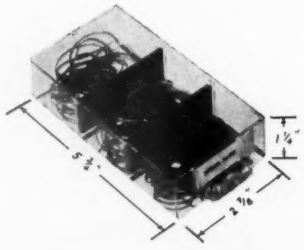
• **3 New Color Combinations**
Cocoa Brown with tan drawers.
Black with gray drawers.
Red with crystal-clear drawers.

• **Solid One-piece Back Panels**
Keep dust out . . . maximum strength girder type construction . . . ready-made keyhole slots for handy wall mounting.

• **Rubber-tipped Cabinet Feet**
Prevent scratching . . . increase stability . . . make stacking convenient.



Illustrated — 48-drawer JIFFY Cabinet, red frame with crystal-clear styrene drawers.....only $19.95*



• **Generously Sized Drawers**
More than 18 cubic inches in each one . . . full set of index labels and drawer dividers supplied with every cabinet.

Inside of drawer easily divided into three compartments with metal dividers as illustrated. Each drawer has a stop to prevent accidental spillage and to permit drawer to hang open from back edge. Ribbed runners on bottom of all drawers permit them to slide freely. Index slots on front of drawers allow easy identification of contents.

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Please send immediately the quantity, size and color JIFFY units as listed:

☐ 48 Drw. @ $19.95* ☐ 32 Drw. @ $12.95* ☐ 24 Drw. @ $9.95* ☐ 16 Drw. @ $7.95*

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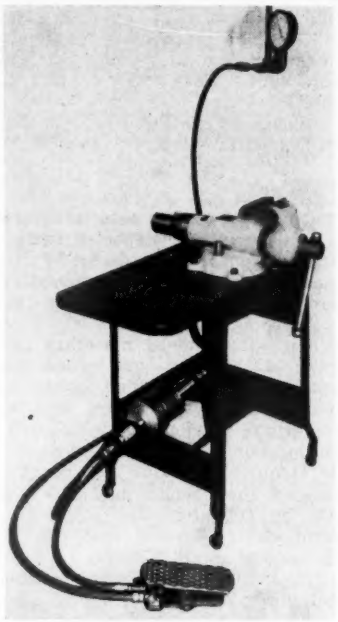
CIRCLE INFORM-A-GRAM KEY NO. 84

For Tremendous Locking Forces

Air Hydraulic Vises Developed by Wilton

The development of a complete line of power operated vises has been announced by Wilton Tool Mfg. Co. To be marketed under the trade mark "WiltOmatic", these vises will substitute normal compressed air pressure for the manual effort ordinarily required for the locking and opening of bench vises.

In order to produce tremendous locking forces and still maintain a compact vise mechanism, a convertor cylinder is used between the foot control and the actual vise, where comparatively

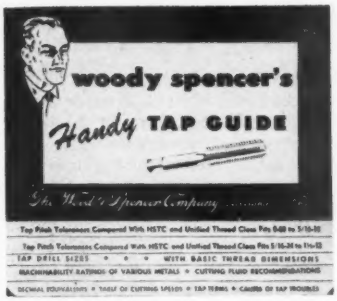


low incoming air pressure is transformed and multiplied into a powerful hydraulic pressure.

One WiltOmatic advantage is the ease with which the vise can be changed from one jaw opening to another. Since the regular vise screw and handle are the master control for the vise, the static jaw setting can be varied merely by rotating the handle of the vise. Thus, the unit can be used both as a power operated vise and a manually operated vise, simultaneously. Also, the jaw of this vise can be adjusted to travel anywhere from 0" to ¾" with each operation.

For specification sheet and engineering data write to Wilton Tool Mfg. Co., 925-941 Wrightwood Ave., Chicago 14, Ill.
Inform-A-Gram Key No. D5.

For Quick Easy Reference . .



THIS HANDY TAP GUIDE is just the thing for making those routine tapping jobs easier. It gives comparisons of tap pitch tolerances with NSTC class fits; tap drill sizes; basic thread dimensions; machinability of various metals; cutting fluid recommendations; recommended cutting speeds; decimal equivalents; tap terminology and causes of common tap troubles. The guide can be placed on the wall or flat on a desk or drawing board. For your copy just drop a line to Wood and Spencer Co., 1932 E. 61st St., Cleveland 3, Ohio.

Circle Inform-A-Gram Key No. D6.

Bench Radial Drill

This drill combines the convenience and accuracy of a sensitive drill, the range and capacity of a large drill with the speed and flexibility of a radial drill.

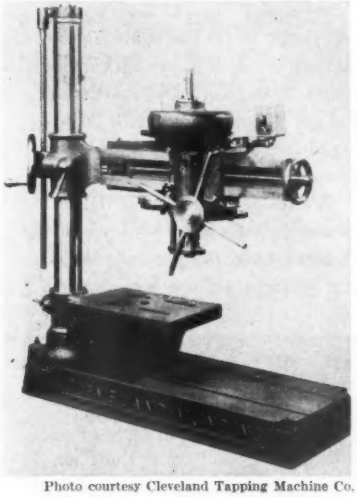


Photo courtesy Cleveland Tapping Machine Co.

The Bench Radial is equipped with a 3⅜" dia. column, has a 24" arm. Capacity in Tool Steel—½". Vertical travel of arm on column of 25" and horizontal travel of head on arm of 18". Spindle travel of 6⅛" and #2 M.T. in spindle. The spindle has 8 speeds from 160 to 3140 R.P.M. and is equipped with a 1/3, 1/2 or 3/4 HP Motor.

It isn't KENDEX* unless it's KENNAMETAL*

KENDEX* is the Registered Trade-Mark of Kendex Tools which are made exclusively by Kennametal Inc.

Kendex tools feature a precision-ground, multiple-edge, screw-mounted, indexable Kennametal insert that needs no regrinding. When the insert's multiple cutting edges become dull, to throw it away is economical practice. Replacement cost is slight compared to that of regrinds.

Kendex tooling minimizes downtime for tool changing, eliminates tool grinding expense, and ends the false economy of reconditioning tools that have outlived their usefulness. Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

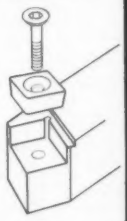
*Registered Trade-Marks

How KENDEX* Works

1

Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.

2



Kendex inserts are mounted to suitable tool holders with socket head screws.

3

When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.

KENNAMETAL*

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

SALES OFFICES IN PRINCIPAL CITIES

A-2

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Perfection Perforating Punches save time and money and speed production by standardization. A current bulletin, available from the Ross Tool Co., 82 St. Paul St., Rochester 4, N. Y., shows the wide range of sizes now on hand, plus specifications.
Circle Inform-A-Gram No. B1

Benefits of Metallizing. A folder on the application of, uses for and benefits of metallizing has recently been published by the Protective Coating Division of Metalweld, Inc., Scotts Lane & Abbottsford Ave., Philadelphia, Pa. Photos, drawings and descriptive copy on the many applications of metallizing as well as data on a new spraying technique are given.
Circle Inform-A-Gram No. B2.

4-D Automatic Turret Lathe. A general description of this lathe is provided in a brochure recently released by the Potter & Johnston Co., Newport Ave., Pawtucket, R. I. General dimensions are given plus interesting data on such subjects as the lathe's base unit, headstock unit, spindle speeds, feeds, cross slide, turret and slide unit, coolant pump, chucks, drive, machine alignment and lubrication.
Circle Inform-A-Gram No. B3.

Control Valves. Bulletin SK53, now available from the Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, reports on the new Valvair Speed King solenoid pilot operated

control valve. The catalog depicts a new concept of valve performance as it gives details and illustrations on this unit which can be used for the control of air or low pressure hydraulic applications.
Circle Inform-A-Gram No. B4.

Tapping Equipment. The Procunier Safety Chuck Co., 18 S. Clinton St., Chicago 6, Ill., presents an illustrated folder giving specifications and advantages of its new high-speed production tapping attachments. Also described are Procunier's cover clamping models for practically every drill press and the firm's new "Tru-Grip" tap holder.
Circle Inform-A-Gram No. B5

Center Tips. Bulletin No. CT-10 available from Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich., illustrates and describes the Colmonoy lathe and grinding machine center tips and tips for centerless grinder blades. The bulletin lists specifications for 48 sizes of lathe and grinder center tips cast from wear-resisting Colmonoy No. 6 alloy.
Circle Inform-A-Gram No. B6.

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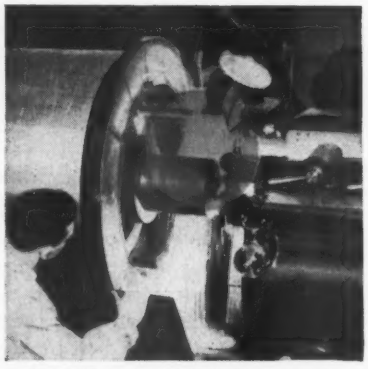
G BOND

for your latest Norton value-adding

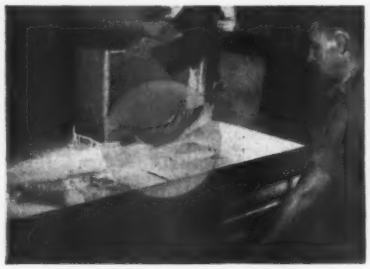


YOU CAN SEE THE DIFFERENCE. The spark stream from a Norton G Bond ALUNDUM wheel is more continuous, more even, indicating uniformity of wheel structure and of cutting action.

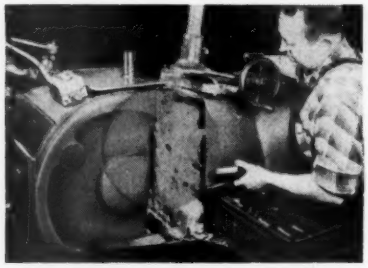
After five years of continuous development and field-testing, Norton's new, exclusive G Bond — the most efficient vitrified bond ever produced — is now ready!

Secret of the new G Bond's great superiority is the way it holds each abrasive grain for maximum cutting action. Then, *just when it should,* it lets go, assuring a constant grinding surface of new grains with fresh, sharp cutting edges.

As a result, Norton ALUNDUM* grinding wheels made with the new G Bond have definite advantages that you can *see* and *hear* as they



YOU CAN HEAR THE DIFFERENCE. Norton G Bond wheels grind with the pleasant, steady swish-h-h of free, easy cutting. You hear no harsh grinding noise.



YOU CAN PROVE THE DIFFERENCE. From general purpose to high production work, every job you do with the new G Bond wheels will benefit by the unique cutting action that grinds faster, freer and cooler,

CIRCLE INFORM-A-GRAM KEY No. 86

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Electrolizing. A booklet has been prepared by the Electrolizing Corp., 1650 Collamer Rd., Cleveland 10, Ohio, defining Electrolizing. It also relates how Electrolizing increases the life and efficiency of metal parts that are subjected to wear, abrasion and corrosion. Case histories on what Electrolizing has done for many manufacturers are included.
Circle Inform-A-Gram No. B7.

Seamless Steel Tubing. Here is a 24-page booklet on the mechanical applications of Shelby Seamless Tubing. It is jam-packed with ideas and suggestions on how to apply the tubing to the best advantage. This National Tube Co. Bulletin No. 17 is distributed by Peter A. Frasse and Co., Inc., 17 Grand St., New York 13, N. Y.
Circle Inform-A-Gram No. B8.

Deep Drawn Boxes. The 1954 Zero catalog listing more than 750 precision, seamless deep drawn boxes available from standard tooling may be had on request from Zero Mfg.

Co., 1121 Chestnut St., Burbank, Calif. The booklet also illustrates some of the precision metal cabinets fabricated for various contractors along with drawn boxes to be used as electronic chassis and cabinets.
Circle Inform-A-Gram No. B9.

Optical Comparator Charts. In Catalog No. 401, Jones & Lamson Machine Co., Springfield, Vt., illustrates and describes radius grid, protractor, screw thread, standard inspection and glass scale charts. Also displayed are combination holders for charts and photographic film and several Jones & Lamson comparators.
Circle Inform-A-Gram No. B10.

Surface Grinders. The latest complete catalog on the Abrasive 1218 Hydrabrasive Surface Grinder with the motorized spindle is now available. This spindle delivers 3 hp direct to the 12" grinding wheel. Write to Abrasive Machine Tool Co., 16 Dunellen Rd., E. Providence 14, R. I.
Circle Inform-A-Gram No. B11.

Gravity Wheel Conveyor Catalog. This booklet describes labor saving, easy to use, easy to move Gravity Wheel Conveyors and accessories for production lines, warehouses, shipping and receiving departments. Write to the Samuel Olson Mfg. Co., Inc., 2423-27 Bloomingdale Ave., Chicago 47, Ill.
Circle Inform-A-Gram No. B12.

Air Powered Jig-Vise. This is a power-operated production jig for drilling, reaming, tapping, milling, assembly and light forming work as well as those "hard to hold" jobs. Further detailed information can be found in Bulletin B-100, offered by Suprecision Products, 2447 Nicollet Ave., Minneapolis 4, Minn.
Circle Inform-A-Gram No. B13.

"TOUCH OF GOLD"

grind — and that are *proved* by the more economical, more profitable work they do.

Make sure you add this new "Touch of Gold" to *your* grinding.

SEE YOUR NORTON DISTRIBUTOR

about arranging a test of one of the new G Bond ALUNDUM wheels in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

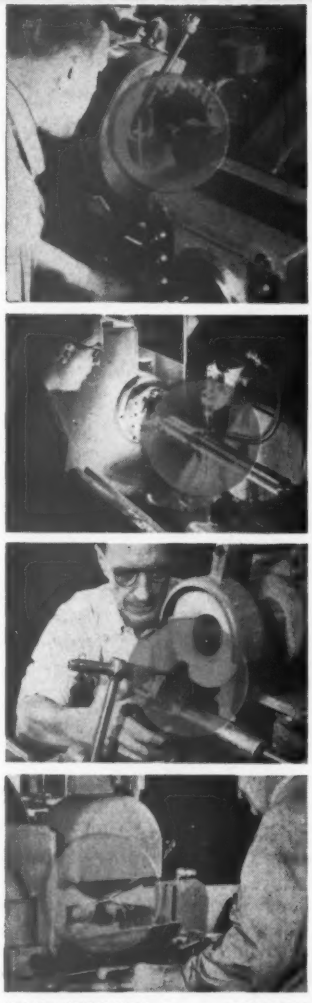
7 BIG ADVANTAGES

Norton G Bond ALUNDUM wheels:

- Do more work per wheel
- Cut freer, cooler, faster
- Dress easier — more pieces per dressing
- Cover a wider range
- Hold shape — better for form grinding
- Hold corners better
- Ideal for crush dressing

NORTON ABRASIVES W-1476

Making better products to make other products better



BROAD USEFULNESS. Norton ALUNDUM wheels in the new G Bond are best for such types of grinding as cylindrical, centerless, surface, internal, gear, tool and cutter, form and thread grinding, and saw gumming.

CIRCLE INFORM-A-GRAM KEY No. 86

Solenoid Valves. Construction features and applications are highlighted in a new catalog on "Do" solenoid valves recently published by the Eclipse Fuel Engineering Co., Rockford, Ill. Also presented are cross section illustrations and specifications.
Circle Inform-A-Gram No. B14.

Air Controls. Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill., presents a preview of its better performance and less maintenance air cylinders in a circular that features cross sectional views, dimensions and specifications.
Circle Inform-A-Gram No. B15.

Tank Heaters. Illustrations and specifications are presented in a new catalog on gas-fired tank heaters published by the Eclipse Fuel Engineering Co., Rockford, Ill.
Circle Inform-A-Gram No. B16.

Non-Destructive Testers. Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y., has just released its newly published 8-page Bulletin No. 10 illustrating and describing its Multi-Method Equipment for non-destructive testing of ferromagnetic bars, wire rods and tubing.
Circle Inform-A-Gram No. B17.

MÄGERLE HYDRAULIC SURFACE GRINDERS

AUTOMATIC DOWN FEED
•
AUTOMATIC FINISH SIZING

A work measuring instrument reveals the difference between work size and required final size during the grinding operation . . . The automatic feeding and sizing is powered by a separate electrical unit . . . The machine requires no attendance during the grinding operation

Finishes within .0002 on repeated chuck loadings automatically . . . Rapid traverse is provided for both head and cross slide . . . Extremely rugged construction and very easy to operate . . . Available in 2 foot, 3 foot and 4 foot models . . .

Write for Our Eight-Page, Illustrated Circular.

PELLOW MACHINE CO.
13500 FOLEY AVENUE • DETROIT 27, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 88

Super Finishing Compound. This is a simplified procedure for lapping, super finishing and polishing metal. It will effectively and economically finish the surface of most dies, tools, molds and mechanical parts. Complete details are yours for the asking by writing to Scientific Abrasives, 5100 N. Canfield Rd., Chicago 31, Ill.
Circle Inform-A-Gram No. B18.

Induction Heating Generators. The newest Ther-Monic product made by the Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y., is the electronic bench-type two-position heating generator for brazing, soldering, hardening, annealing and melting. Case histories on the advantages of this generator are presented as well as photos, dimensions and illustrations.
Circle Inform-A-Gram No. B19.

Move Models—Not Machines. Designed by South Bend Lathe to make available a modern method of shop layout, the Model Planning Kit described in Bulletin 5301 provides a means for shop officials to avoid costly guesswork. Opportunities which this "3-Dimension" layout offers over the 2-d blueprints are described. Write to South Bend Lathe Works, South Bend 22, Ind.
Circle Inform-A-Gram No. B20.

Heat Treating Units. Illustrations, new design features and complete specifications of various units are given in Bulletin T-19 on Ipsen Series T 100% Forced Convection controlled atmosphere heat treating equipment. Made by Ipsen Industries, Inc., 715 S. Main St., Rockford, Ill., the units are designed for the automatic and efficient processing of short and long run work.
Circle Inform-A-Gram No. B21.

Air Tool Catalog. A new 12-page catalog, No. JE-1660, with complete illustrations, descriptions and specifications on the Thor No. 2 series of light-weight, air-operated drills, grinders, screwdrivers and nut setters is now available from the Thor Power Tool Co., Aurora, Ill. A recent addition of reversible screwdrivers and nut setters to the No. 2 class line brings the total tools of this class to more than 100.
Circle Inform-A-Gram No. B22.

Silicone Products. Here is a cross-reference application index to the new 1953-54 guide to Dow Corning silicone products. The products are described largely in terms of operating and service characteristics. Fifteen new products, ranging from adhesives to molding compounds, have been added to this year's guide which is available from the Dow Corning Corp., Midland, Mich.
Circle Inform-A-Gram No. B23.

Precision Jig Borer. Table settings on the Lindner Jig Borer are guaranteed accurate to 0.00015". Readings in 0.00005 are provided by a unique integral optical measuring system. Kurt Orban, 205 E. 42nd St., New York 17, N. Y., is the sole American distributor of this Western German-made precision machine. Orban is offering an illustrated catalog giving detailed information and specifications on the jig borer and its accessories.
Circle Inform-A-Gram No. B24.

High Vacuum Pumps. The many uses and advantages of vacuum pumps made by the Kinney Mfg. Co., Washington St., Boston 30, Mass., are described in an attractive, illustrated brochure now being offered by the firm. Featured in the brochure is the Kinney rotating plunger high vacuum pump which is mechanical and oil sealed and was especially developed for industrial application. The pump is capable of operating over long periods with minimum maintenance and upkeep.
Circle Inform-A-Gram No. B25.

Machine Tool Attachments. Lathe converters are the latest addition to the line of multi-purpose motorized lathe attachments for milling, grinding and keyseating made by the Master Mfg. Co., Hutchinson, Kansas. The lathe converter is a portable many-purpose motorized metal working machine, with inter-changeable heads or spindles to accomplish all types of machine shop operations. The converter and other attachments are vividly displayed in an illustrated booklet being offered by Master.
Circle Inform-A-Gram No. B26.

Lathes & Accessories. This catalog describes the newest features of the Logan line of 9", 10", 11" and 12" lathes, lathe accessories and the

Logan 8" shaper and accessories. For your copy write to Logan Engineering Co., Lathe Division, Lawrence & Lamon Aves., Chicago 30, Ill.
Circle Inform-A-Gram No. B27.

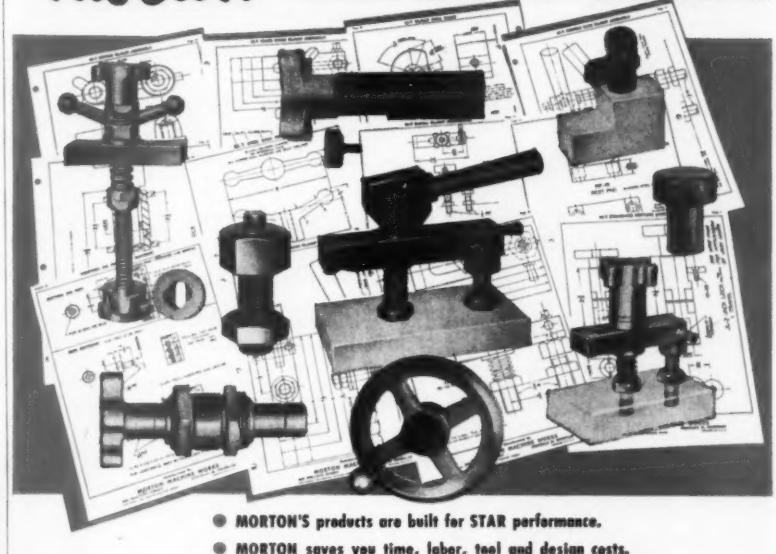
Magnetic Perforating Dies. The advantages of these dies, manufactured by S. B. Whistler & Sons, Inc., 762 Military Rd., Buffalo 23, N. Y., are covered in detail in the firm's Catalog M53.
Circle Inform-A-Gram No. B28.

Adjustable Perforating Dies. For perforating materials up to and including ⅛" mild steel, S. B. Whistler & Sons, Inc., 762 Military Rd., Buffalo 23, N. Y., has several types of adjustable perforating dies. A few of the die setups are illustrated and described in the firm's Catalog 53.
Circle Inform-A-Gram No. B29.

High Temperature Tubing & Pipe. This folder presents condensed technical data on 14 tubing steels used in high temperature or high pressure service. Information on analyses, mechanical and physical properties creep strength, short-time elevated temperature tensile properties and oxidation resistence is presented on tubing steels ranging from plain low carbon steel to 25% chromium-20% nickel stainless steel. Copies of this folder, TDC 163, are available from Tubular Products Division of the Baccock & Wilcox Co., Beaver Falls, Pa. **Circle No. B30.**

SERVING "INDUSTRY" FOR OVER 30 YEARS

RELY ON Morton MANUFACTURERS OF HIGH QUALITY FIXTURE CLAMPS AND COMPONENTS



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- MORTON'S products are built for STAR performance.
- MORTON saves you time, labor, tool and design costs.
- SAVE by using them as STANDARDS. There's a size and type to fit your most rigid requirements.
- Highest quality of workmanship and materials maintained.
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- Your Tool Stores should have a representative stock of all MORTON'S details. Individual parts or complete assemblies.
- Illustrative Catalog containing full size templates of each product for tracing into your design.

MORTON MACHINE WORKS
2425 WOLCOTT ST. DETROIT 20, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 89

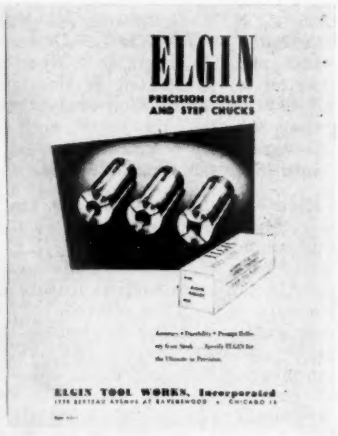
Die Making Machine. Features and specifications of die making machines produced by Rice Pump & Machine Co., Belgium, Wis., are contained in new bulletin available.
Circle Inform-A-Gram No. B31.

Carbide Tools. Specifications, prices and data on carbide tools make up the 92-page Catalog 54 put out by the Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Some of the tools displayed in this attractive brochure are milling cutters, end mills, reamers and drills.
Circle Inform-A-Gram No. B32.

Truarc Grooving Tools. Facts, figures, charts and illustrations that demonstrate how their equipment can be employed to the best advantage, are included in a technical manual on Truarc Grooving Tools available from Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, New York. Other information in the literature covers cutting ranges of the tools, uses of the tools, accessory parts and case histories on industrial problems that were solved by the use of these grooving tools.
Circle Inform-A-Gram No. B33.

BALL BEARING RETAINER
THIS IS EXCLUSIVE
WITH LEMPCO
. . . AND HERE'S WHAT IT MEANS TO YOU:
It means POSITIVE REGISTRATION at the shear point—at the first stroke and at the millionth . . . and DIES LAST LONGER.
It means LOW FRICTION die set operation, eliminating galling of pins . . . speeding production.
It means TIME SAVING on short runs or long runs. Save as much as 15 minutes out of every 60 in die assembly.
Yes, you can forget your lubrication troubles with Lempco Anti-Friction Ball Bearing Die Sets with patented MINUS TOLERANCE Ball Bearing Retainers.
CUT COSTS PER PIECE
PRODUCE PRECISION QUALITY
Licensed Under Inventions of Guy O. Connor
LEMPCO
BALL BEARING DIE SETS
LEMPCO PRODUCTS, Inc., Industrial Division . . . Bedford, Ohio
CIRCLE INFORM-A-GRAM KEY No. 90

Collets & Step Chucks. Now available is a new catalog with descriptions and prices of Elgin Draw-in Chucks and Collets. Also explained are some of the reasons for the growing popularity of Step Chucks as well as a listing of the sizes most generally used. Write to Elgin Tool Works, Inc., 1772 Berteau Ave., Chicago 13, Ill.



Circle Inform-A-Gram No. B34.

Tooling For Welding. The Cecil C. Peck Co., 4614 Prospect Ave., Cleveland 3, Ohio, displays its line of universal ram welders in an illustrated catalog now available. Also portrayed are pipe rotators, flux elevators, turntables and other high speed precision production equipment.
Circle Inform-A-Gram No. B35.

Automatic Deburring. The power brushing method of automatic deburring is explained in this illustrated folder available from the Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio. Actual case histories aid in showing the advantages of deburring with the new Osborn method.
Circle Inform-A-Gram No. B36.

Carbide Tools. The Adamas Carbide Corp., Department ADT3, Harrison, N. J., has a catalog now available on its 11 styles of single point standard carbide tools that have been added to the firm's line of tungsten carbide tool tips, dies and wear parts. The new line of tools has finished diamond ground cutting edges.
Circle Inform-A-Gram No. B37.

Groove Gages. Reliant Industries, 4947 Firestone Blvd., South Gate, Calif., produces groove gages for checking ¼" to 4⅞" bore diameters accurately and quickly. These gages also may be used for checking out-of-round, inside diameters, deep holes, recesses, taper and inside spherical radii. For complete specifications write for Catalog No. 53A.
Circle Inform-A-Gram No. B38.

Shapers, Press Brakes, Squaring Shears. This is a pocket-sized booklet with good pictures and detailed descriptions of the above mentioned products manufactured by the Cincinnati Shaper Co., Cincinnati 25, Ohio. Ask for the "Magic Circle" pamphlet.
Circle Inform-A-Gram No. B39.

Precision Equipment. A brand new catalog, just off the presses, describes Challenge's precision equipment for the tool and machine industries. Illustrated and explained are time-saving devices and tools for layout, inspection, assembly and general production. This catalog (No. 838) is available from Challenge Machinery Co., Grand Haven, Mich.
Circle Inform-A-Gram No. B40.

Silent Stock Tube. The Corlett-Turner Co., 1001 S. Kostner, Chicago 24, Ill., has a new brochure out on its line of silent stock tubes for screw machines. The booklet explains how the CT tubes eliminate noise where it originates and improves efficiency by reducing operator fatigue, permit quicker detection of operational difficulties and improves employee morale.
Circle Inform-A-Gram No. B41.

Pneumatic Bar Feed. A new 4-page folder describing the Lipe-Rollway Automatic Magazine Loading (AML) Pneumatic bar feed for use with most types of single-spindle automatic screw machines is now ready for distribution. The brochure lists case histories of the AML bar feed's performance in actual shop tests. Write to Lipe-Rollway Corp., 712 Emerson Ave., Syracuse 1, N. Y.
Circle Inform-A-Gram No. B42.

Presses. A revised edition of a catalog describing the complete line of Stokes single and rotary tableting presses has just been issued by the F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia. Particular attention is given to describing the applications for which each model is best adapted. Also described, are the punches and dies which Stokes supplies for use with the presses. Ask for Catalog No. 801.
Circle Inform-A-Gram No. B43.

Data Sheet. Tumbling Sales & Service Co., King St., Greenwich, Conn., announces that each product in their line of barrel finishing compounds is now furnished in its own distinctive color. Each color approximates as closely as possible the pH characteristic of the individual compound and serves as a rough guide as to whether the product is acid, neutral or alkaline. Detailed data sheets on these compounds are available upon request.
Circle Inform-A-Gram No. B44.

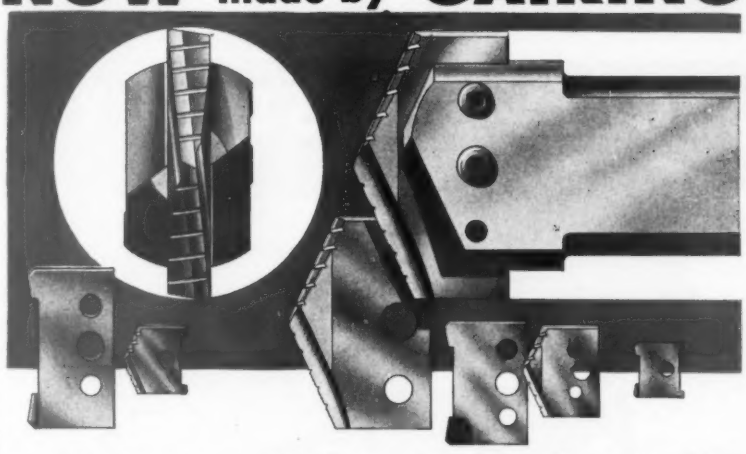
Forging Presses. The Ajax Mfg. Co., 1441 Chardon Rd., N., Cleveland 17, Ohio, presents an illustrated brochure on its high speed, solid steel forging presses. Featuring air clutch operation, these presses come in sizes 300 tons to 8000 tons.
Circle Inform-A-Gram No. B45.

Precision Boring Machine. Described in detail is the Style 17 precision boring machines made by the Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. The booklet, Bulletin No. 31205, contains many practical examples of tooling on the various models. **Circle No. B46.**

Control Valves. The Quick-As-Wink line of air and hydraulic control valves and valve couplings are on display in the latest catalog available from C. B. Hunt & Son, Inc., Salem, Ohio.
Circle Inform-A-Gram No. B47.

Remote Valve Control. Flexible shafting for the remote control of valves is the subject of a new 16-page manual now being furnished by the Stow Mfg. Co., 82 Shear St., Binghampton, N. Y. A chart is given for the selection of the correct flexible shaft for any value.
Circle Inform-A-Gram No. B48.

NOW made by GAIRING



Drill Large Holes from the Solid with Interchangeable Spade Drills

Made in 256 cutter sizes, 1 to 5 inch diameter, in steps of 1/64, Conner type Spade Drills drill the required diameter in one operation, need no retracting to clear them of chips. Only eight sizes of holders are needed to handle all cutter sizes.

For general purpose work and in the Tool Room, use the cutter and holder assembly shown above. It is a rugged tool of great rigidity, recommended for large holes of medium depth.

For Production Drilling (for repetitive work), and for the somewhat deeper holes, use Conner type Oil Hole Holders designed for easy coolant flow and fast chip expulsion.

For Boring: Core Drill Cutters, for semi-finishing of cored and drilled holes, are made in the same 256 sizes, to fit the same spade drill holders.

The Gairing Tool Company is now the exclusive manufacturer of the Spade and Core Drills, both standard and special, formerly made by the Conner Tool & Cutter Company.

Send for Catalog and Price List

GAIRING TOOLS

The GAIRING TOOL COMPANY • 21227 Hoover Road • Detroit 32, Michigan
In Canada: *A. C. Wickman (Canada, Ltd.) Queensway, Toronto 14*
CIRCLE INFORM-A-GRAM KEY No. 91

Testing Machines. Universal screw power testing machines have such advantages as the ability to hold a stress or strain in the elastic range indefinitely when the loading is stopped; unlimited testing stroke over the complete distance between upper crossing and weighing table; assured crosshead speeds not affected by temperature changes; and ability to handle greater off-center loads. In a brochure now available American Machine and Metals, Inc., East Moline, Ill., discusses in detail these advantages, together with other good points.
Circle Inform-A-Gram No. B49.

Hand Pushed Trolleys, Cranes, Switches. Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich., announces publication of a new catalog on the above mentioned products.
Circle Inform-A-Gram No. B50.

Rotary Cam Limit Switch. Developed to meet specific needs of mechanical press automation devices, a new rotary cam limit switch has been announced by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. Photos and diagrams are included in literature now available on the switches.
Circle Inform-A-Gram No. B51.

TODAY'S BEST BUY!

JOHNSON Model B

A full 5" x 10" capacity, low cost, handy saw for use in both small and large plants. Get details. Write today.

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JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 92

Industrial Electronic Instrumentation. Direct reading electronic instruments for application to industrial and laboratory problems are illustrated and described in this brochure released by the Berkeley Div., Beckman Instruments, Inc., 2200 Wright Ave., Richmond, Calif.
Circle Inform-A-Gram No. B52.

Aluminum Strip. Scovill Mfg. Co., Waterbury, Conn., has just issued a new 20-page booklet covering its 64 years in the aluminum industry. The booklet announces the latest research efforts by Scoville in developing a new industry standard in controlled quality and uniformity of cold-rolled aluminum strip.
Circle Inform-A-Gram No. B53.

Mild Steel Electrode. A. O. Smith Corp., Welding Products Div., Milwaukee 1, Wis., features its SW-15 universal electrode in a recently printed illustrated folder now being distributed. The bulletin relates how the electrode was developed to be used for an extremely large number of welding applications. Also explained is the ease of handling this electrode, the weldments quality and how it eliminates costly operations.
Circle Inform-A-Gram No. B54.

Speed Finishing. "What Is Advanced Barrel Finishing?" is one of the topics of discussion in the Supersheen Speed Finishing brochure put out by the ALMCO Division of the Queen Stove Works, Inc., Albert Lea, Minn. Other subjects taken up in this well-illustrated booklet are how this type of finishing differs from tumbling, features of Supersheen Speed Finishing and various deburring and finishing equipment.
Circle Inform-A-Gram No. B55.

Heat Treating Controls. Hays Instruments and Controllers are applicable to practically every type of furnace manufactured for the heat treating of metals, regardless of type, method of firing, fuel burned or treatment to be performed. A bulletin is available from the Hays Corp., Michigan City, Ind., showing the broad application of the instruments and controls. Also, schematic drawings illustrate some of their more common uses.
Circle Inform-A-Gram No. B56.

Heat-Treating. In this extremely attractive brochure, the Loftus Engineering Corp., 610 Smithfield St., Pittsburgh 22, Pa., shows how its engineers have equipped plants with heat treating furnaces that are achieving greater fuel economy. Discussed in the brochure are wire furnaces and Loftus continuous heat treat lines, shuffle-hearth furnaces.
Circle Inform-A-Gram No. B57.

"X.L." High Speed Tool Steels. The Latrobe Steel Co., Latrobe, Pa., announces the production of high speed tool steels of regular analyses, to which has been added uniformly distributed sulphide lubricants in an entirely new form. Latrobe claims that longer tool life will result in using "X.L." steels. Further information is available from the steel firm.
Circle Inform-A-Gram No. B58.

Sonic Inspection, Measurement & Control. Revolutionary testing techniques that have been developed by Sperry Products, Inc., Danbury, Conn., are described in a recent brochure put out by the firm. In it you will find detailed descriptions of the latest ultrasonic non-destructive testing equipment. In writing ask for Bulletin 50-110.
Circle Inform-A-Gram No. B59.

Borescopes. These precision instruments for visual inspection are described in a booklet entitled, "Precision Instruments for the Exacting Inspection of Internal Surfaces." The standard model with dimensions is listed in an accompanying mimeographed sheet. Write to American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York 59, N. Y.
Circle Inform-A-Gram No. B60.

Bench-Type Mills. Eleven different operations can be performed on the 3-way hand lever travel bench-type mills produced by the Barker Engineering Co., 500 Green Rd., Cleveland 21, Ohio. What these operations are and a list of the many industries making precision items that use this machine will be found in an illustrated brochure available from Barker.
Circle Inform-A-Gram No. B61.

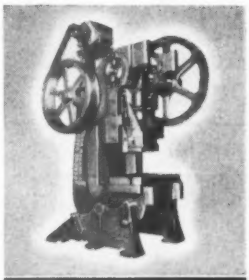
Solving Fastening Problems. The Milford Method, a scientific approach to product and parts assembly, is explained in an illustrated brochure now available from the Milford Rivet & Machine Co., Milford, Conn. Among other things, the booklet gives you an idea how engineering the solution, inquiry analysis and laboratory research all take an active part in solving industrial fastening problems.
Circle Inform-A-Gram No. B62.

Stock Gears & Speed Reducers. A new catalog describing the entire line of stock gears, speed reducers, sprockets and chains, couplings, and special gears has been issued by Grant Gear Works, Inc., 154 West Second St., Boston 27, Mass. Spiral bound for easy reference, this booklet also contains 40 pages of useful tables and engineering information relating to power transmission.
Circle Inform-A-Gram No. B63.

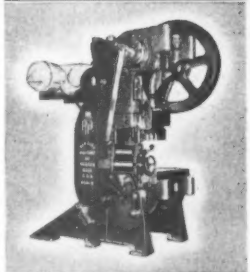
Tungsten Carbide Components. Sintercast Corp. of America, 134 Woodworth Ave., Yonkers 2, N. Y., specializes in the manufacture of "Sinterforge" made to order tungsten carbide components in accordance with the customer's blueprints and specifications. The "Sinterforge" booklet illustrates Tungsten Carbide Components ranging from pieces as small as ½ gram to those weighing as much as 18 pounds. Also pictured, are the variety of shapes and forms made by Sintercast. Write direct to the company for your copy or—
Circle Inform-A-Gram No. B64.

For Metal Processors & Finishers. Klem Chemicals, Inc., 1440 Lanson Ave., Dearborn, Mich., now has a catalog available on selecting the correct chemicals for various operations. **Inform-A-Gram No. B65.**

Gritcloth. You can use each side of Gritcloth, made by Bay State Abrasive Products Co., Westboro, Mass., until all the abrasive is worn out. Some of its innumerable uses are for finishing, polishing or deburring metals or for rubbing down prime coats of paint. For further information write for the Bay State circular.
Circle Inform-A-Gram No. B66.

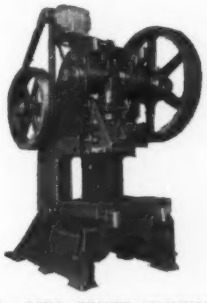


#700 B GEAR PRESS



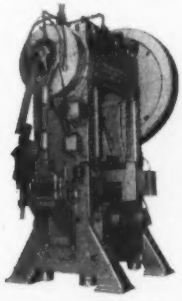
650-B PLAIN FLY WHEEL

No. 10M FLYWHEEL PRESS



No. 800B GEARED INCLINABLE PRESS

Illustrating a few of the many types and sizes of standard Perkins Presses. Presses built to customers' special specifications.



No. 12-H-36 STRAIGHT SIDE, SINGLE CRANK TIE-ROD CONSTRUCTION PRESS CAPACITY 200 TONS

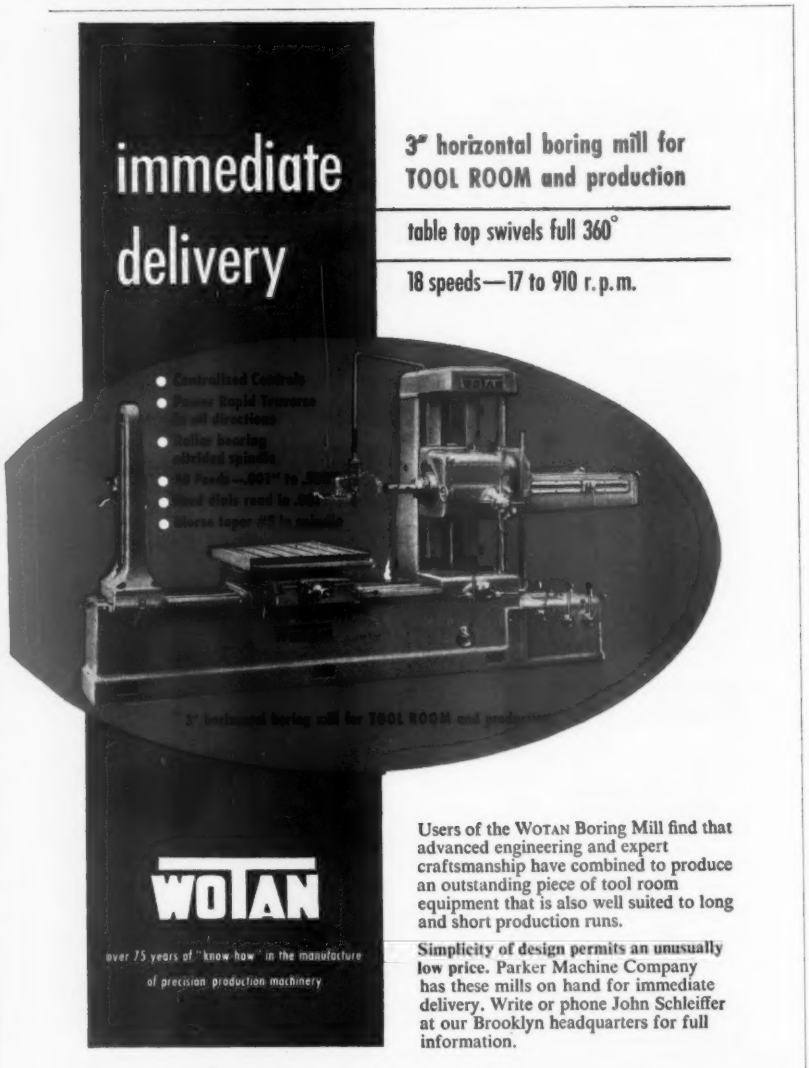
Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 93

"Coordinated Creative Engineering & Manufacturing." The W. F. & John Barnes Co., 301 South Water St., Rockford, Ill., has been designing and building equipment for more than 75 years. The organization is presenting a booklet showing the scope of its work with illustrations on some of the products which are indicative of the development and history of the company. Mentioned in the booklet are special machine tools, handling and conveying equipment and electrical controls. For your copy write direct to the company or— **Inform-A-Gram No. B67.**

Metal Fabricating. A colorful 8-page bulletin with 32 illustrations presents the various types of sheet steel and aluminum cabinets and enclosures fabricated by Danco Metal Products, Inc., 24000 Detroit Rd., Westlake, Ohio. Also shown are the complete plant facilities and equipment made available at Danco for industrial and commercial weldments. The products illustrated range from large cabs for power shovels to X-ray cabinets and instrument panels. For your copy write direct to the company or— **Circle Inform-A-Gram No. B68.**



Users of the WOTAN Boring Mill find that advanced engineering and expert craftsmanship have combined to produce an outstanding piece of tool room equipment that is also well suited to long and short production runs.

Simplicity of design permits an unusually low price. Parker Machine Company has these mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.

Parker Machine Company, Inc.

158 PIONEER ST., BROOKLYN 31, NEW YORK • TRIANGLE 5-2103 and 2157

TOOL & CUTTER GRINDERS | ENGINE LATHES | HORIZ. & VERT. MILLERS | VERTICAL TURRET LATHES | 16" AND 22" SHAPERS

CIRCLE INFORM-A-GRAM KEY No. 94

Extrusion Presses. The Lake Erie Engineering Corp., Box 68, Kenmore Station, Buffalo 17, New York, has just published a new 8-page bulletin on its Horizontal Extrusion Presses. Designed for aluminum, brass and other non ferrous metals, these completely self-contained models have features that speed production and improve performance standards. When writing, ask for Bulletin 14.9. **Circle Inform-A-Gram No. B69.**

Rotating Eqiupment. The Bryant Chucking Grinder Co., Springfield, Vt., is offering a folder covering their high frequency rotating equipment. These motors are not only used for high speed grinding but have found commercial application in the textile, electronic and woodworking industries. The folder being offered gives general construction details as well as application, specifications and other pertinent data. **Circle Inform-A-Gram No. B70.**

Precision Tools. Here is a picture story of a modern industrial plant located in Ferndale, Mich. Tools, gages, fixtures and precision machined ground parts are fabricated from bar stock, castings or forgings in the C. M. Smillie & Co., plant at 1100 Woodward Hts., Ferndale 20, Mich. The firm will gladly send you a brochure covering its products along with a series of excellent photos that are the next best thing to taking an actual trip through the plant. **Circle Inform-A-Gram No. B71.**

Jig & Body Fixtures. The Smith Engineering & Tool Co., 191 Bay Ave., Glen Ridge, N. J., now has available a new publication describing its standard jigs and body fixtures. These parts come in 7,000 sizes and are definite aids in reducing design, tooling and production costs by eliminating grinding, welding, warpage and other costly operations as well as rejected parts. **Circle Inform-A-Gram No. B72.**

Wheel Guards. Morrison Products, Inc., 16816 Waterloo Rd., Cleveland 10, Ohio, announces a new line of wheel guards for flaring cup and straight cup wheels. They represent a completely new principle of guarding grinding wheels as the guards revolve with the wheel. A 4-page illustrated brochure describes the product. **Circle Inform-A-Gram No. B73.**

Quick-Quench Heat Treat Furnace. A new brochure, the "Knapp-Lee Quick Quench Aluminum Heat Treat Furnace," has been prepared by the James H. Knapp Co., 1731 Workman St., Los Angeles 31, Calif. The booklet contains illustrations and specifications. **Circle Inform-A-Gram No. B74.**

Plug Gages. The S & E Machine Products, Inc., 18353 W. McNichols Rd., Detroit 19, Mich., has its Bulletin No. 105 now available. It describes and illustrates its new line of tungsten carbide plug gages. Specifications are also given.
Circle Inform-A-Gram No. B75.

Chain Drives. A new 16-page, pocket size catalog (B55-53) listing prices and specifications for Morse Taper-Lock stoek roller chain sprockets is now available from the Morse Chain Co., 7601 Central Ave., Detroit 10, Mich. Tables in the catalog list hp ratings, taper-lock bushing, sprocket specifications and prices, and roller chain and part specifications with prices for ½", ⅝", 3/5", 1" and 1¼" pitch chain.
Circle Inform-A-Gram No. B76.

Knuckle-Joint Press. E. W. Bliss Co., Canton, Ohio, features its 4,000-ton knuckle jointed press in a recent edition of its quarterly publication, "Bliss Trends." The company claims this machine which weighs 305 tons and stands 34 feet high, is the world's largest knuckle-joint press. The magazine also contains articles on the Bliss rolling mill, Navy gun mount production and 42 ways to modernize obsolete presses.
Circle Inform-A-Gram No. B77.

Multi-Tappers. For multiple tapping and drilling, here is a machine that features positive action silent drive and can be furnished built in for most any type of drill press available, for tapping at various levels and for various pitched tapping in the same operation. Illustrations and complete details are presented in a folder now being distributed by the Charles L. Jarvis Co., Middletown, Conn.
Circle Inform-A-Gram No. B78.

Electronic Scale & Printer. Instrumentation Data Sheet 10.18.4 describes the Electronic Scale and Printer manufactured by Gilmore Industries of Cleveland, Ohio. The instrument provides a permanent, accurate record of weighing operations on card or tape. The circular can be obtained from the Industrial Division of the Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa.
Circle Inform-A-Gram No. B79.

Pressure Plugs. Heat treated precision pressure plugs, which seal tight without sealing compound by crushing crests and roots in softer threads of mating tapped parts, are discussed in a new bulletin prepared by Standard Pressed Steel Co., Box No. 600, Jenkintown, Pa. In pictures, drawings and text, the bulletin describes the sealing operation of the threads.
Circle Inform-A-Gram No. B80.

Heat Treating Furnaces. The best designed machine will not stand up to hard production use unless the correct material is used and the parts properly heat treated to give the best operating result. Electric furnaces, manufactured by the K. H. Huppert Co., 6830-32 Cottage Grove Ave., Chicago 37, Ill., are designed to operate from 300° F. to 2300° F and will give good uniform heat. A bulletin describing the standard sizes of furnaces produced by the firm is available. You can write direct to the company for your copy—or
Circle Inform-A-Gram No. B81.

Precision Twist Drills. Complete specifications on high speed and carbon twist drills made by the Precision Twist Drill & Machine Co., 5023 W. Armitage Ave., Chicago 37, Ill., are given in the firm's latest catalog.
Circle Inform-A-Gram No. B82.

Collet Closer. News of the Adams Air Collet Closer is presented in a small but informative folder now available from I. W. Adams & Associates, Engineers, 4200 W. Burbank Blvd., Burbank, Calif. This Collet Closer is available for all lathes with 1⅜" hollow spindle. **B83.**

When you "SAVE"...
YOU LOSE!
"Saving" by making your own punches is old-fashioned and expensive.
Here's why:
1. PORTER PUNCHES are available for immediate delivery.
..... they save time — money — by keeping your expensive help at profitable jobs.
2. PORTER PUNCHES are made to "stand the gaff."
..... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.
..... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.
..... only a "specialist" can make punches as well—or as inexpensively.
Check your labor costs — your "down-time"— and order
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— for immediate delivery.
Save time — save money — with top quality punches and die buttons.
Look to Porter for
the punch you need... when you need it!
Remember — you don't save by making your own punches — you lose.
"Still the best performer"
PORTER PRECISION PRODUCTS
Porter Punches are in stock in all principal cities
Cincinnati 15, Ohio
CIRCLE INFORM-A-GRAM KEY No. 95

MEN YOU SHOULD KNOW . . . . . .

Ross B. Hopkins

James C. Deckert

W. J. "Walt" Scowcroft

James Bere

George Herrick

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COVERS INDUSTRIAL AMERICA
YOUR
"DETROIT" DIE SET MAN
CAN HELP YOU
Your "Detroit" Die Set man knows die sets. Call him in . . . talk over your die set problems with him. Get from him full facts about the accuracy of "Detroit" parallel surfaces, the trueness of pins, the fine finish, the thorough inspection at the factory. You'll see that "Detroit" leaves nothing undone to assure easier mounting and longer production runs. Call your "Detroit" man.
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DAYTON HE 3042
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MONTREAL, CAN. WI 1186
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DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

CIRCLE INFORM-A-GRAM KEY NO. 96

Ross B. Hopkins has been appointed plant metallurgist at Rodney Metals, Inc. of New Bedford, Mass. Hopkins has been associated with the American Steel & Wire Company for the past 13 years.

◆

The Pivot Punch and Die Corp. of North Tonawanda, N. Y., announces the appointment of **James C. Deckert** as secretary of the corporation and member of the Board of Directors. Deckert has been comptroller of the organization for a year and a half.

◆

W. J. "Walt" Scowcroft, previously associated in the automotive and industrial tool supply field will cover the New England area as district manager for Lempco Products, Inc. of Bedford, Ohio. Scowcroft, whose headquarters will be in Rumford, Rhode Island, adds his 13 years experience to an expanding Lemco sales force.

◆

Clearing Machine Corp. of Chicago announces the appointment of **James Bere** as a sales engineer to represent the power press manufacturer in Southern Ohio. Bere holds a B.S. degree in Industrial Management and a Masters Degree in Business Administration from Northwestern University, His experience with Clearing includes both sales and service department work. Clearing, also, has established a new sales headquarters in Lansing, Michigan with **George Herrick** in charge. The Lansing location will be operated as a branch of the Detroit office. The new address is 201½ E. Grand River, East Lansing, Mich.

. . . . . MEN YOU SHOULD KNOW

Wilbur C. Stauble

W. Alexander McCune, Jr.

Col. Willard F. Rockwell

Ben Snyder

Howard K. Sagerlind

New president and chief executive officer of the Holo-Krome Screw Corp. and a director and member of the Veeder-Root, Inc., is **Wilbur C. Stauble,** a founder of the Holo-Krome concern. Stauble fills the vacancies caused by the resignation of United States Senator William A. Purtell.

◆

W. Alexander McCune, Jr., has been named general sales manager of Norton Company of Canada, Ltd. A former abrasive engineer in the northern New Jersey area, McCune took over his new post at the beginning of this month.

◆

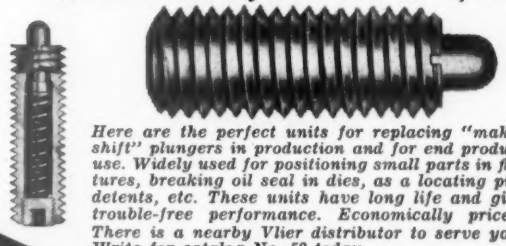
Col. Willard F. Rockwell, who has been chairman of the board of the Timken-Detroit Axle Company and Standard Steel Spring Company, has become chairman of the Rockwell Spring and Axle Company, a firm that was organized as a result of the consolidation of the Timken-Detroit and Standard Steel firms.

◆

The E. W. Bliss Co., Canton, Ohio has appointed **Ben Snyder** as its Dayton, Ohio sales engineer. Mr. Snyder brings 8 years of engineering experience with the Bliss Toledo Service Division to his new position. He joined the company in 1945 after serving in the Armed Forces in World War II. Prior to that, he was Traffic Manager for the Gendron Wheel Company in Toledo. Bliss also reports that **Howard K. Sagerlind** has joined the firm's Can Machinery sales office in New York. Formerly, Sagerlind served Bliss for 6 years as an engineer specializing in can machinery.

VLIER Spring Plungers and Stops

Save You Money in Hundreds of Ways



Here are the perfect units for replacing "makeshift" plungers in production and for end product use. Widely used for positioning small parts in fixtures, breaking oil seal in dies, as a locating pin, detents, etc. These units have long life and give trouble-free performance. Economically priced. There is a nearby Vlier distributor to serve you. Write for catalog No. 58 today.

Completely assembled units, available in 17 sizes.

Pre-set, constant (1-42 lbs.) spring pressures. National Coarse Thread No. 1 fit.

Hardened plungers and rust-proof finishes give long life.

True plunger alignment in all positions. Fully telescoping.

SPRING STOPS

For use where fixture design prevents the mounting of spring plungers. Body is jig-drilled for bolting to fixture-base. Has case-hardened, radiused nose. Available in two sizes with 14 or 32 lbs. spring pressure.

VLIER

ENGINEERING, INC.

4552 BEVERLY BLVD., LOS ANGELES 4, CALIF.

Distributors of Torque Thumb Screws, Toggle Pads, Fixture Keys

CIRCLE INFORM-A-GRAM KEY NO. 97

NEW BIG CATALOG

NOBLE & STANTON STANDARD

JIG & FIXTURE PARTS

66 PAGES

150 DRAWINGS

Hundreds of new sizes and parts • Many exclusive patented items not available elsewhere • Advanced engineering features.

SEND FOR YOUR FREE COPY NOW!

Finest Quality NS Components

FOR YOUR TOOLING PROGRAM—AT NEW LOW PRICES!

New, from cover to cover, this valuable catalog presents all the popular, widely used Noble & Stanton Standards . . . plus over 300 new and exclusive sizes and types of jig and fixture parts.

A valuable contribution to the industry, this book illustrates standards you can use every day—to cut your design time and tooling costs. Tracing sheets are available.

NS Standards are the best you can buy. Advanced, design, rugged construction and long, hard service are assured. Adopt them as standards in your plant, and save!

STANDARD PARTS CO.
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Please send your NEW CATALOG of Standard Jig and Fixture Components.

NAME ..... TITLE .....

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Manufacturers of GENUINE NOBLE & STANTON *Parts*

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CIRCLE INFORM-A-GRAM KEY No. 98

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28 pages of KNOW-HOW on the blanking, punching, perforating and bending, forming, deep drawing, and spinning of the stainless steels.

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Gentlemen: Please send me at once:

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_____Both books at the special combination price of $2.25*

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Open account shipments on company purchase orders. Otherwise, check with order, please. No C.O.D.'s, please. *Ohio customers add 3% sales tax.

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2	22	39	73	92	108	116D	126B	131	136D	142B	149A	156A	159E	163B
3	23	40	74	93	109	117	126C	132A	137	143A	149B	156B	159F	163C
4	24	51	76	94	110	119A	126D	132B	138A	143B	150	156C	159G	165
5	25	61	77	95	111	119B	127	132C	138B	143C	151	156D	159H	166
6	26	63	79	96	112	119C	128A	132D	138C	143D	152A	157A	160A	
7	27	65	80	97	113	120A	128B	132E	139A	143E	152B	157B	160B	
8	28	66.1	81	98	114A	120B	128C	132F	139B	143F	152C	157C	160C	
10	29	66.2	82	99	114B	120C	128D	133	139C	144A	153A	157D	160D	
12	30	66.3	83	100	114C	122	128E	134A	139D	144B	153B	158A	160E	
14	31	66.4	84	101	115A	123A	129A	134B	139E	144C	154A	158B	161A	
16	32	66.5	85	102	115B	123B	129B	134C	140A	145A	154B	158C	161B	
17	33	66.6	86	103	115C	123C	129C	134D	140B	145B	154C	158D	162A	
18	34	67	88	104	115D	123D	129D	135	140C	145C	154D	159A	162B	
19	35	69	89	105	116A	124A	130A	136A	140D	146	155A	159B	162C	
20	36	71	90	106	116B	124B	130B	136B	141	148A	155B	159C	162D	

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3	23	40	74	93	109	117	126C	132A	137	143A	149B	156B	159F	163C
4	24	51	76	94	110	119A	126D	132B	138A	143B	150	156C	159G	165
5	25	61	77	95	111	119B	127	132C	138B	143C	151	156D	159H	166
6	26	63	79	96	112	119C	128A	132D	138C	143D	152A	157A	160A	
7	27	65	80	97	113	120A	128B	132E	139A	143E	152B	157B	160B	
8	28	66.1	81	98	114A	120B	128C	132F	139B	143F	152C	157C	160C	
10	29	66.2	82	99	114B	120C	128D	133	139C	144A	153A	157D	160D	
12	30	66.3	83	100	114C	122	128E	134A	139D	144B	153B	158A	160E	
14	31	66.4	84	101	115A	123A	129A	134B	139E	144C	154A	158B	161A	
16	32	66.5	85	102	115B	123B	129B	134C	140A	145A	154B	158C	161B	
17	33	66.6	86	103	115C	123C	129C	134D	140B	145B	154C	158D	162A	
18	34	67	88	104	115D	123D	129D	135	140C	145C	154D	159A	162B	
19	35	69	89	105	116A	124A	130A	136A	140D	146	155A	159B	162C	
20	36	71	90	106	116B	124B	130B	136B	141	148A	155B	159C	162D	

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A2	A14	A26	A38	B8	B20	B32	B44	B56	B68	B80	C9	E5	I1	
A3	A15	A27	A39	B9	B21	B33	B45	B57	B69	B81	C10	E6	I2	
A4	A16	A28	A40	B10	B22	B34	B46	B58	B70	B82	D1	E7	P1	
A5	A17	A29	A41	B11	B23	B35	B47	B59	B71	B83	D2	E8	P2	
A6	A18	A30	A42	B12	B24	B36	B48	B60	B72	C1	D3	E9	P3	
A7	A19	A31	B1	B13	B25	B37	B49	B61	B73	C2	D4	E10	P4	
A8	A20	A32	B2	B14	B26	B38	B50	B62	B74	C3	D5	E11	P5	
A9	A21	A33	B3	B15	B27	B39	B51	B63	B75	C4	D6	E12	P6	
A10	A22	A34	B4	B16	B28	B40	B52	B64	B76	C5	E1	E13	P7	
A11	A23	A35	B5	B17	B29	B41	B53	B65	B77	C6	E2	E14	P8	
A12	A24	A36	B6	B18	B30	B42	B54	B66	B78	C7	E3	E15	P9	

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A2	A14	A26	A38	B8	B20	B32	B44	B56	B68	B80	C9	E5	I1	
A3	A15	A27	A39	B9	B21	B33	B45	B57	B69	B81	C10	E6	I2	
A4	A16	A28	A40	B10	B22	B34	B46	B58	B70	B82	D1	E7	P1	
A5	A17	A29	A41	B11	B23	B35	B47	B59	B71	B83	D2	E8	P2	
A6	A18	A30	A42	B12	B24	B36	B48	B60	B72	C1	D3	E9	P3	
A7	A19	A31	B1	B13	B25	B37	B49	B61	B73	C2	D4	E10	P4	
A8	A20	A32	B2	B14	B26	B38	B50	B62	B74	C3	D5	E11	P5	
A9	A21	A33	B3	B15	B27	B39	B51	B63	B75	C4	D6	E12	P6	
A10	A22	A34	B4	B16	B28	B40	B52	B64	B76	C5	E1	E13	P7	
A11	A23	A35	B5	B17	B29	B41	B53	B65	B77	C6	E2	E14	P8	
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- Diamond Powder—its Production and Use
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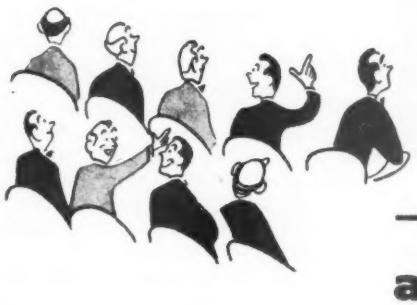

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AL FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY No. 101

. . . Month's Talk, from page 27

able at the cutter. Greater horsepower at the cutter will enable much better utilization of carbide tools for machining tough metals. If multi-speed motors are used they should be properly engineered so that speed changing will not damage machines or parts.

7. That the following machines be adaptable for hot forming operations; (a) hydraulic presses, (b) punch presses, (c) drop hammers, (d) air stamps, (e) stretch presses, and (f) power brakes. It must be remembered that the gauge and type of material being formed does not retain heat for any length of time, consequently dies or tools must be heated. The equipment should be capable of functioning properly where die or tool temperatures may go as high as 400°F. Heat losses through the machine should be held to reasonable limits.

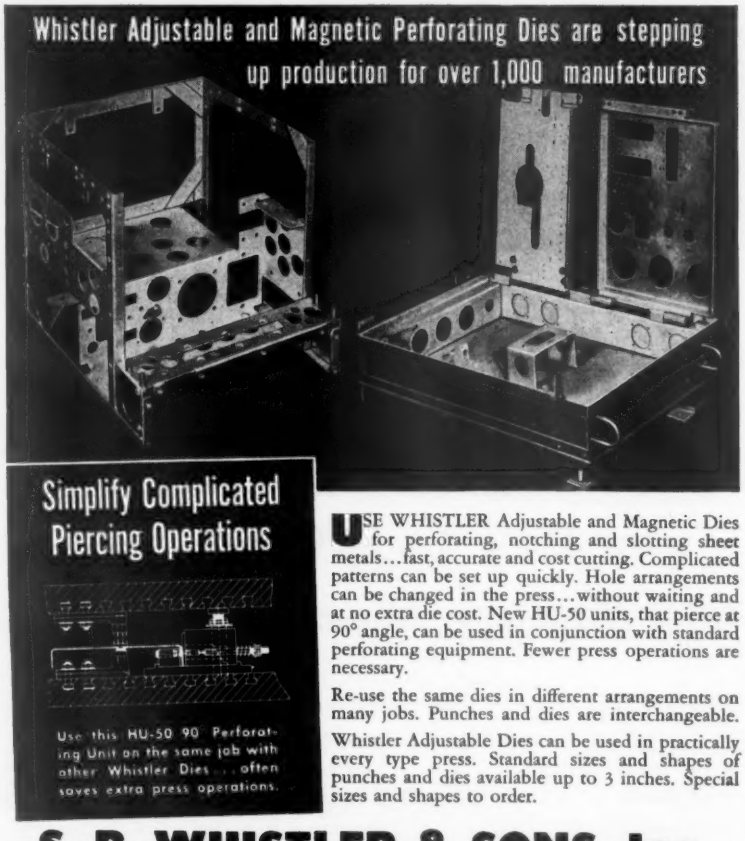
Safety

The aircraft industry is proud of the safety record it has maintained for years in a rapidly changing field of endeavor. It is only natural that all incoming equipment be checked for safety devices that enable us to reduce hazards. We have received cut-off saws, press brakes and similar potentially dangerous machines that were not properly equipped with limit switches and did not provide maximum personnel protection. If additional protective equipment is thought advisable, it is installed before the equipment is put into operation. We have installed motor plugging equipment on circle saws, high-speed mill and router motors. The plugging feature, by stopping the cutter except during actual cutting operations, improves the safety rating of the machine and increases the potential output by speeding adjustments and retooling.

Production Problems

Aircraft designers, in attempting to keep abreast of day-to-day improvements must constantly refine and change their design. This, of course, at a sacrifice to quantity. Shop orders for airframe parts are issued in relatively small quantities. This means that normal production machines undergo numerous setups during a shift. Motorized adjustments on power shear back gauges, punch presses, sheet rolls, power brakes, hydraulic presses and other equipment would fill a serious need in airframe production.

Machine tool procurement often causes excessive installation problems which must be eliminated. It is our recommendation that quotations to the purchaser state physical size of control cabinets, power panels and other auxiliary equipment. Recommended minimum clearances on all sides of major and minor components should also be defined. Without the above information, it is not possible to intelligently plan shop layouts which must be prepared months before installation. It is suggested that complete prints of machine outline, foundation, conduits and piping requirements and installation instructions, with ideal and alternate layout of components, be forwarded to the customer upon receipt of the purchase order. Better schematic wiring, hydraulic diagrams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and sequence of operation should be included. This will facilitate the field adaptions and modifications to satisfy special installation conditions.

New Machine Tool Requirements

We would like to have the machine tool industry develop four items of special interest to the aircraft builders.

1. Production of form blocks is one of the bottlenecks that plague the airframe industry. If a machine tool was available that could finish mill form blocks, from a saw cut plate, many of the present operations could be eliminated. Such a mill should be capable of operating through a range of plus or minus 20° from perpendicular to the base. Control of contour and bevel should be obtained from lines appearing on photo-print detail.

2. We need a machine that will simultaneously produce male and female pierce blank dies. The male punch material is usually 4140 chrome-molly, while the female die may be of the same material but is usually kirksite. The tolerances of male and female dies should be consistent with recommended practices for this type of operation. Here again, lines appearing on photo-print detail should control the actions of the cutters.

3. We would like to see the industry produce a 360-cycle motor, approximately 15 horsepower to sell as a package. This package should include alternators, controls and motor plugging features, complete. This motor would be widely used for routing and high-speed milling.

4. We desire a machine that will rapidly, accurately and economically produce helical templates. These templates will replace the present linear templates that are fastened along the length of the bed of the spar milling machines. The advent of long spar mills with multiple carriages makes the use of linear templates almost prohibitive. The solution seems to be individual helical templates for each carriage.

Invitations are extended to interested concerns to examine present practices and inspect available tools with the hope that unique machine tools may be produced that will satisfy our particular needs.

INDUSTRIAL NEWS

Carpenter Steel Company. C. Donald Steinwedel of Bristol, Virginia, has joined the Carpenter Steel Company's Alloy Tube Division as sales representative in five southeastern states. His appointment was announced recently by P. L. Coddington, sales manager of the Tube Division in Union, N. J.

Steinwedel now represents the company in North and South Carolina, Tennessee, West Virginia and Kentucky. He was engaged by Carpenter shortly after his release from active duty with the Army Corps of Engineers. During his tour of duty, he was head of the training division of the Engineer Aviation Unit Training Center at Fort Huachuca, Ariz.

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Over 25,000 TORIT DUST COLLECTORS Now in Operation

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. . . Hardness Testing, from page 78

in the day. They increase precision, because a tired operator is not so reliable in operations and in observing readings.

Portable Direct Dial Reading

A portable hardness tester which has become quite popular will test any size, shape and type of material. It is a direct dial reading instrument built in six ranges consisting of Rockwell A, B, C, 15N and Brinell medium and low scales.

The tester is designed with two handgrips extending outward from the dial body. The base is provided with grooves across the bottom so that small rounds can be tested. The grooves also assist in centering the instrument on very small pieces.

Because of its weight (30 ozs.) and size (3" high) it is easily taken to any job for a direct reading test.

The tester has a spring-loaded diamond indentor. Readings appear on a 2" diameter scale. To take a hardness measurement, the handgrips are pressed downwards. This action lowers the indentor housing to bring the under surface of the tester against the surface of the material to be tested. After which, further depressing of the handgrips ensures that the point of the indentor penetrates the surface of the test material under the action of the calibrated helical spring. The movement of the indentor as it penetrates the material slightly compresses the diaphragm of a fluid-filled chamber. Fluid is thereby forced further into a capillary tube, which encircles the dial to indicate the hardness number on the dial scale. The movement of the indentor into the material is magnified about 3,000 times by the fluid displacement in the capillary tubes. The final position of the fluid indicates the hardness value directly on the scale.

Testers for Large Pieces

There are some cases in which pieces to be Rockwell tested have rather extensive dimensions, even though they are not of great mass. In order to devise a machine giving sufficient room to accommodate such pieces, a work-elevating screw of the type used in standard sizes of Rockwell testers have been incorporated into a frame, made up of a base piece and a cross-head of considerable length, joined by suitable strain rods at the ends.

This provides the effect of an open frame through which work may be extended as desired. The penetrator is located 16" from each pillar or strain rod. It will apply a major load of 60, 100 or 150 kilograms, the same as any standard Rockwell tester. Usually, where a tester is built in this manner, it is provided with 12" of vertical capacity. However, using the same base and cross-head castings, testers can be built with any desired vertical capacity.

Special internal hardness testors of Rockwell type have been provided which are used exclusively for testing inner surfaces of cylinders and rings. These are built as nearly as possible like standard Rockwell models, yet have to be considerably different in design, be-

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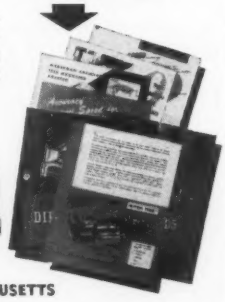

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cause much of the mechanism is undesirably crowded into the limited diameter of an arm, entering the cylinder to be tested. Inevitably, therefore, a certain amount of the sensitivity of standard Rockwell machines is lost in this type, though it is found adequately accurate by most users.

There is also a universal testing unit of Rockwell type, recommended for testing large and heavy work that cannot be readily tested in any standard size Rockwell machine. This is really a special penetrator head, which provides a standard testing unit for mounting in whatever design of rigid frame an individual firm chooses to build to meet peculiar testing needs. The rigid supporting frame employed must be designed so as to suit the intended application. It often includes facilities for advantageously handling the pieces being tested.

Different Numeral Colors

There are countless cases in which Rockwell hardness testing machines are employed in connection with the "B" scale only. There are many, many other cases where testing machines are used only on the "C" scale. However, dial indicators employed are equipped with black numerals on the outer circle of the dial, and with red numerals on the inner circle. The black numerals are read when testing hard metals with a diamond penetrator, while the red numerals are used for reading hardness of softer materials, on which the steel ball penetrator may be employed.

Thus, the same unit is quickly adaptable for either type of test, so far as reading proper hardness numbers is concerned. Operators having little or no skill can measure hardness with a precision equal to that of experts. All motions are easy to learn, and require so little effort that women readily become as proficient as men.

If and when any friction or drag of the tripping lever on the loading beam of a Rockwell tester occurs, a cause of serious error is introduced. On one line of testing machines providing Rockwell readings, there is incorporated a so-called zero drag tripping lever, which keeps the major load (like the minor load) accurate, regardless of the operator's technique. These machines have their operating screws completely enclosed, and incorporate dials correct to .000008". They have simple and easy adjustments for wear. All of these are accessible from the outside, and can be made by any competent mechanic.

It often becomes necessary or desirable to provide hardness numbers in some scale foreign to the particular type of testing device being used. In many instances, a relatively-accurate chart may be developed which will correlate hardness numbers of two separate systems. Such correlation must be made at a given load level, so that two columns of figures may be set down, representing correlative hardness numbers all the way down the operative scale. Many times, such correlated charts may be obtained directly from manufacturers of hardness testing machines. In some instances,

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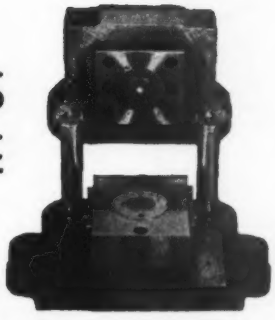

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correlative charts between micro-hardness testing machines and standard Rockwell scales have been developed.

Portable Tester Reaches Tight Places

One very interesting type of portable hardness tester, designed to give Rockwell readings, has been found highly useful for hardness inspection of incoming raw materials, production testing of parts such as crankshafts, cylinder blocks, assemblies and similar pieces which cannot readily be taken to bench-type hardness testers. It has also been found useful in aircraft maintenance shops, in field service at the well for the oil industry, and on various types of field inspection work service.

This device is comparable in accuracy to the standard bench-type hardness tester, and provides a direct dial reading like Rockwell testers in general. It is capable of testing parts 5" in diameter or thickness, and from that point down to zero. It gains access to parts inaccessible to most types of hardness testers, and can test both inside and outside surfaces of tubing, castings, etc.

Due to the independence of the Rockwell test to surface conditions of specimens, less difference is observed in testing rounds and flats by this method. Except where rather soft material is involved, there seems but little difference in readings on flat material and material having a radius of ½". However, where close hardness tolerances are important, and must be related to readings on flat surfaces, the radius of curved work should be specified. For small rounds, one should always specify whether the flat or cylindrical surface is tested.

Tube Testing Methods

In regard to tube testing, the same process is used as in testing solid rounds, unless the wall is thin, or the material is soft, or the diameter of the tube is sufficiently large in proportion to its wall thickness to invite deflection under test. Many tubes can be and are satisfactorily tested without using any mandrel. Even brass tubing generally requires no mandrel. Where it is desired to test inner surfaces of tubes with standard Rockwell testers, it can be done with special gooseneck devices developed for the purpose.

These take the form of a gooseneck adapter for the penetrator. The adapter is machined from tool steel. Special machines with gooseneck plunger extensions may also be obtained for internal testing of rings or tubes too great in diameter for standard gooseneck adapters. In some instances where tubing to be tested internally is too small in diameter to accommodate the standard size of "Brale" or ball penetrator, a special short-nib "Brale" penetrator may be employed.

Sheet metal hardness testers are of different types. Some are based on the proposition of forcing a tool (which is a perfect hemisphere) into the sheet metal, so it will form a dome in the sheet. Pressure is continued to the point of fracture. Care

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is used when the moment of fracture is reached, for then, the depth of impression has to be read off a scale on the lower part of the machine. In examining the tested specimen, both formation of the fracture and structure of the dome are observed. If the fracture runs in one certain direction, the metal is known to be fibrous and not very suitable for drawing or folding purposes.

Should the structure of the dome appear closegrained, the cause may be found in excessive annealing, or (where brass sheets are concerned) in too sharp pickling. By observing smoothness or roughness of the dome, an indication of the heat treatment and grain size of the metal is obtained. The character of the break indicates not only grain size, but will also show presence of small cracks and other imperfections in the metal. While this is as much a workability test as a hardness test, hardness is definitely involved.

Tester Stamps or Flashes Green Light

One highly interesting sheet metal hardness tester has been developed for use in hand feeding parts under the indentation point of the tester unit. This point moves up and down, with a slow, rocking-arm motion. This provides for accurate, high speed, production-line hardness testing of sheet metal parts. The indenter point of the unit moves up and down approximately 40 times per minute. If a part being tested measures up to specified hardness, an electrically-operated plunger automatically stamps it with an inspector's stamp. At the same time, a meter counter (which is incorporated in the base of the testing machine) counts those pieces which come up to specification.

There are some cases where an inspector's stamp is not desired on parts being tested. Then, a selector switch disengages the plunger and a green light flashes in place of the stamping operation. If material being tested is too soft, the plunger or the light remains inactive, and the part cannot be certified for use. A little practice with a machine of this kind enables an operator to quickly set it for different hardness requirements and different material thicknesses. A dial is contained in the base of this unit, so that visual readings of hardness may be made if desired.

Cases arise where it becomes necessary to test soft sheet metal. This is very difficult to test with standard machines of any kind. For use on such work, one manufacturer provides what he calls a "baby Brinell" machine. It operates on the Brinell principle, but uses light loads and a small ball. The load is applied directly from dead weights to the ball stem.

This arrangement assures great sensitivity and reliability under light loads involved. A 1/16 inch ball is used with a load of 12.61 kilograms. This load has the same relation by Brinell formula to the 1/16 inch ball as the 500 kilogram load does to the 10 mm ball in the standard Brinell test. This ma-

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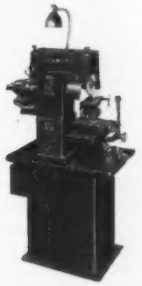

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chine can also be supplied with combination weights, which will give a load of 14 or 28 pounds. Such weights are chiefly used for testing gold and dental materials.

Rockwell Testing Sheet Metal

Sheet metal may be tested on standard Rockwell machines, using either the Rockwell B or C hardness scales. Depth of impression of the penetrator and Rockwell hardness numbers obtained depend partly on the hardness of metal penetrated and partly upon hardness of the metal considerably below the actual impression. It is therefore plain that where thin sheet metal is being tested, not enough metal exists below and around the indentation to give normal resistance. Since the anvil employed is not integral with the specimen, it cannot, regardless of its hardness, substitute for specimen thickness.

As sheet metal tested is of thinner gauge or softer quality, the effect of the anvil comes more and more into the picture. If the metal is sufficiently thin or soft to register a compression mark (or to cause any protrusion) on its reverse side, (the side that was against the anvil) it means that the anvil tends to give a somewhat different reading than the true Rockwell number. If any such marks are not visible on the reverse side after making the test, readings observed on the gauge may safely be taken as the Rockwell hardness number, without making any allowance or correction. Special hardness testers are available for use on sheet metals too thin or too soft to provide accurate readings from standard Rockwell machines.

It is possible to test some plastic materials on standard Rockwell hardness testers. Some test phenolic laminated sheets, vulcanized fiber, lead, hard rubber, etc., on these units. However, these materials have a tendency to flow continually under sustained uniform pressure. Therefore they require special large ball penetrators of ¼ inch or ½ inch diameter, together with major loads of 60 or 100 kilograms. It is also necessary to provide a time factor. That is, load application must be for a certain duration of time, as six seconds, eight seconds, ten seconds, etc.

Rubber Hardness Testers

Some manufacturers have developed standard rubber hardness testers. One such tester determines the ASTM hardness number by indentation. This tester is widely used in determining hardness of rubber, certain types of plastics and similar materials. It has also been used as a reference standard for calibrating other types of rubber hardness instruments.

The tester incorporates a glass plate on which specimens are placed, after which an operating knob is turned counterclockwise. This action first lowers a pressure foot of the instrument until contact is made with the test specimen. The pressure foot is subjected to a freely-acting load of five pounds. As the knob is turned further, the indenter is automatically lowered, and a freely-acting dead weight of three pounds contacts the specimen.

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A versatile machine with simplicity of design that permits an unusually low price while reflecting quality, accuracy and practical utility . . . A product where advanced engineering and expert craftsmanship have joined to bring out an outstanding piece of equipment adapted to tool room use, yet sufficiently rigid for the requirements of production shops . . . Standard table 40" x 9" with larger table optional. Equals or exceeds a light No. 2 in capacity.

INDEX BUILDS BETTER MILLS . . . WRITE FOR LITERATURE

INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 108

. . . NTDMA, from page 68

Fultz, Superintendent of Tools and Methods, Eastman Kodak Company, Hawk-Eye Works, Rochester, New York, discussed usual and unusual tool room measurement with contour projection.

Allen W. Rucker, President of The Eddy-Rucker-Nickels Company, management consultants, Cambridge, Massachusetts, explained the "Rucker Share of Production Plan."

Other events during the four-day session included a panel discussion on "Apprenticeship in Tool, Die and Machine Shops" with Jack Kleinoder, Secretary-Treasurer of John Volkert Metal Stampings, Inc., Queens Village, New York, serving as moderator. Panel members were John D. Dewhurst, President, Arrow Tool Company, Inc., Hartford, Conn.; J. J. Kohl, Chairman of the Board, The International Tool Company, Dayton; Archie McMillan, Manager, Helfrecht Machine Company, Saginaw, Michigan; Richard F. Moore, President Moore Special Tool Company, Inc., Bridgeport, Conn.; and Thomas C. Roberts, President, Kobzy Tool Company, Chicago.

The Board of Trustees approved the extensive recommendations of NTDMA's Committee on Apprenticeship to accelerate the special tool and die industry's apprentice training program. Apprenticeship standards for tool and die makers were also approved. Reports from trustees representing the nation's 21 key tool centers indicate that widespread interest in apprenticeship on the part of students, educators industrialists and civic leaders, has been created throughout the country by the Association's newly-released motion picture, "Tool and Die Making—Keystone of Mass Production."

—— • ——

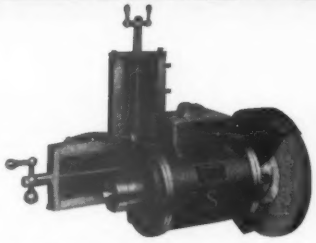
Oven Manufacturer Uses Basco Steel Separators

Basco Separators were recently put to use in the G. S. Blodgett Co., plant in Burlington, Vermont, manufacturers of industrial ovens. These separators have made handling of the many steel parts in the fabrication of Blodgett baking and roasting ovens more economical and the operators handle the small blanks of steel sheets in both punch press and press brake operations with greater ease.

Basco separators operate on the principle of inducing a magnetic field in the stacked steel sheets causing the top sheets to separate from the remainder of the stack as shown in the illustration. This makes for easy removal of the top sheet. Regardless of shape, the Basco Separator will fan out the sheets, even if they are saturated with oil.

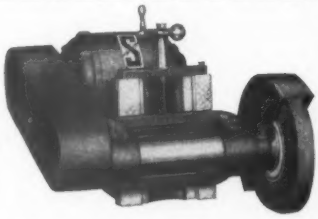
Photo courtesy Basco Manufacturing Co.

it's STANDARD for Motorized Spindles

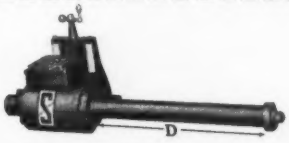


Angle Plate Grinder with horizontal and vertical feeds. ¼ to 10 H.P.

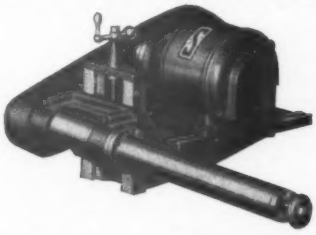
Vertical Spindle Grinder with or without feeds. ½ H.P. to 50 H.P. "A" dimension to order up to 16". For Planer, Boring Mill, Surface Grinder, Milling Machine.



Belt Driven Lathe Grinder. ¼ H.P. to 20 H.P.



Internal Grinder, direct motor drive. Grind up to 30" deep. ½ to 5 H.P.



Belt Driven Internal Grinder. Grind up to 24" deep. ¼ to 5 H.P.

Vertical Spindle Grinder, belted motor drive, ½ to 5 H.P.

B = Adapter to fit in ram of Boring Mill.

Write for Catalog 44

THE STANDARD ELECTRICAL TOOL CO.
CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 109

INDUSTRIAL NEWS

Ready Tool Company. Mr. Carl B. Christensen, president of Ready Tool Company, Bridgeport, Conn., announces that the Machinists' Tool & Supply Company, 3690 Santa Fe Avenue, Los Angeles 58, California, has been appointed as exclusive distributors for the RED-E line of anti-friction, high speed, and carbide-tipped centers, grinder and milling machine dogs. They will cover the Los Angeles and southern California areas. The Di Eugenio Tool Center, 119 South 11th Avenue, Phoenix, Arizona, recently held an open house for manufacturers, their purchasing and engineering personnel, covering the states of Colorado, New Mexico and Arizona. The purpose of the open house was the opening of their new building at this new location. Many world famous automotive and machine tools and accessories were shown, including the line of Ready Tool Company's centers. Di Eugenio was recently appointed exclusive Ready Tool sales engineers for Colorado, New Mexico and Arizona.

★ ★ ★

Singleton Company. The ideal combination of electro-chemical equipment manufacturing with nationwide distribution was achieved by the merging of Singleton Company with the General Supply Company, both of Cleveland, Ohio, according to T. R. Gill, Vice President and General Manager of the latter firm.

Albert Singleton continues as President of the manufacturing concern in the new set-up as the Singleton Company, and now conveniently located with General Supply at 5317 St. Clair Avenue.

The move provides Singleton with a 100% increase in plant space for his rapidly expanding production, now 3 times that of a year ago. Singleton startled the electro-chemical processing industry in 1946 with his introduction of "Singleton Fusion-Welded Equipment" of transparent "acrylic" plastics such as Lucite and Plexiglass. The use of these materials in the equipment improves and speeds up processing, resists acids and alkalies, lasts indefinitely without contamination or deterioration, offers clear visibility and costs less to own, operate and maintain. The line includes plating barrels, tanks, liners, baskets, buckets, etc., and a recently developed salt spray cabinet. Their construction is made practical by the exclusive Singleton "Fusion-Weld" which produces a permanent, no-leak seam stronger than the material itself.

★ ★ ★

Minneapolis - Honeywell Regulator Company announced recently it had received a $16,850,000 order from the U. S. Air Force to supply an advanced electronic automatic pilot for

A MOVABLE HORIZONTAL SURFACE
for YOU
. . . . . REMOVE
UP
PORTELVATOR®
(The Handy Hamilton Portable Elevating Table)
DOWN
FETCH . . . .
● In hundreds of spots throughout your operation you are required to lift or lower, take or fetch. Tools and dies must move from storage to machine—from machine to storage. Materials must be positioned. Machines must be fed.
Consider this fact! You can accomplish many industrial movements better and cheaper with Portelvator, the handy Hamilton portable elevating table, than with any other means or device regardless of cost. Take another look at your operation, then take a look at the exclusive mechanical lift principle which is employed in all Portelvator applications. Write for free bulletin P-5309.
●
Portelvator® employs an exclusive mechanical lift principle based upon power transmission through meshing worm, worm gear, and screw. Load capacities to 20 tons. Stationary or portable. Power operated or manual. Push button controlled or completely automatic. Vertical movement to 10 ft. Table sizes to suit requirements. Tilt tops. Flat tops. Roller tops. — Take another look at your operation . . . and at Portelvator. Write now!
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INDUSTRIAL NEWS

one of the nation's newest jet fighters — the Northrop F-89D Scorpion.

The autopilot — designated by the Air Force as the E-11 — is designed not only to increase the efficiency of jet fighters in combat, but also to provide relief for the human pilot.

Along with having the ability to guide jet fighters to targets with electronic precision, the autopilot is engineered so that it can be tied in with a radar fire control hookup to direct a plane accurately to its target long before the human pilot ever sees it.

A. M. Wilson, vice president in charge of the firm's Aeronautical Division, said approximately two years would be required to complete the order, the largest single contract for such equipment received by the Division since World War II. Honeywell has been a leading producer of automatic Pilots for the military since it designed the first all-electronic autopilot during World War II.

Wilson said the company was continuing to supply autopilots for helicopters and bombers, including the B-36, but that jet fighter autopilots were becoming an increasingly dominant factor in the company's autopilot business. He added that orders totaling nearly $3,000,000 previously had been received for the E-11.

"In our development of autopilots," Wilson said, "we have anticipated the increased emphasis being placed on fighter aircraft by the military. This has enabled us to have a fighter autopilot ready when needed. Extensive research and development work is now going forward on still more advanced autopilots involving new concepts."

★ ★ ★

Carboloy Department of General Electric Company. A carbide-lined die that has drawn more than 5000 tons of solid steel without developing an approach wear ring serious enough to require servicing recently has been taken out of operation by the Wyckoff Steel Company.

The R-16 die was delivered by the Carboloy Department of G. E. in March, 1951, and it remained in use until May of this year — a total of 26 months service — when a crack developed. The finished size at delivery was 2.4315, in a six-inch tapered case. When taken out of service, the size was 2.434, an increase of only .0025.

In all, 10,420,955 pounds of solid bar stock in grades F.S. 1117 and F.S. 1118 (equivalent of C-1117 and C-1118) with 1/16-inch reduction were drawn. All bars were push started with a bench speed of 65-70 feet per minute.

During its life, the die was never polished. According to officials at Wyckoff Steel Company's New England Works, this far exceeds the life of other similar dies and is thought to be a record for this type of operation.

Hamilton PRECISION DRILLING MACHINES • TAPPING MACHINES GEAR HOBBERS

If your work can be done within the framework of the specifications of these machines you can not buy a more precise tool than one bearing the Hamilton nameplate.

THE HAMILTON VARIMATIC® SUPER SENSITIVE DRILLING MACHINE is designed for the accurate production-drilling of small holes in all drillable materials. Its capacity ranges from .004" to .3125" and its spindle speeds, which range from 840 to 9300 R.P.M., are infinitely variable.

CLEARANCES Center of chuck to column..... 5"
Round table to chuck.....10"

THE HAMILTON NO. 00 PRECISION GEAR HOBBER is a machine of extra precision and extra rigidity. It is used for the generation of spur gears and pinions to 2" outside diameter of the workpiece. Alignment and trueness of the work spindle and hob spindle is held to within .0002". Accumulative error is regularly held to .0002" or less.

THE HAMILTON NO. 1 PRECISION GEAR HOBBER generates spur and spiral gears, worms and worm gears, splined shafts, gear sectors and pinions of extra accuracy and at high production speeds. The alignment and trueness of the work spindle and hob spindle is held to within .0002". Accumulative error is regularly held to .0002" or less. Maximum workpiece diameter is 6".

THE HAMILTON SUPER SENSITIVE, SMALL HOLE TAPPING MACHINE is designed and built to serve the precision industries. Its tapping capacity is from the smallest and finest tap to 10/32 inclusive. Its spindle speeds range from 1200 to 2600 R.P.M.

CLEARANCES Center of chuck to column....3¼"
Round table to chuck.....4"

Selection of a Hamilton tool, even though your present work does not require Hamilton accuracy, is a wise and far-sighted decision, for Hamilton's production potential and "reserve of accuracy" permits you to face possible specification changes with complete confidence.

Prepare now to meet restless competition in the months ahead. Equip your plant for precision production and be confident that your competition can not deliver more.

Mail the coupon today for complete FREE information on any or all of the Hamilton machines shown.

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- *New Literature*

WHAT'S NEW

Plastic tooling is lightweight, low in cost, and saves time in tooling up. Dimensionally stable Ren-ite, a resin that sets at room temperature, is used in making master Keller models and duplications; mock-ups; sheet metal dies; nesting, polishing, and welding fixtures. Informative booklet now available. Ren-ite Plastics, Inc., P. O. Box 1256, Lansing 4, Mich.
Circle Inform-A-Gram No. P1.

Four versatile phenolic molding compounds are described, and typical uses illustrated, in a recently published pamphlet. Comparative properties are given for four classes of materials—general purpose, special high strength, heat resistant, and low-loss electrical. Ask for "Bakelite Phenolic Molding Plastics". Bakelite Co., 30 E. 42nd St., New York 17.
Circle Inform-A-Gram No. P2.

MID-WEST WHEELS CUT SURFACE GRINDING COSTS!

S11A Mid-West cool cutting wheels have been tested in the tool rooms of our customers all over the country. Results: operating costs were cut, while grinding efficiency was increased!

The reasons are simple. First, because of the quality of materials used. Made with a sharper, harder Aluminum Oxide grain in a glassy vitrified bond, Mid-West wheels offer top grinding results; yet you save on costs. Second, because each Mid-West cool cutting wheel is made for a specific tool room application. Using the right wheel for the right job not only increases grinding efficiency, but speeds up your production time. Your results are bound to be better! See for yourself . . . right in your own plant!

For complete information regarding Mid-West cool cutting grinding wheels, write, wire or phone today.

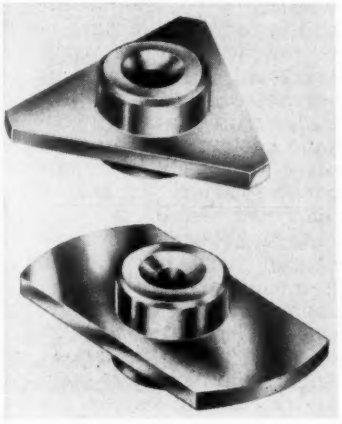
MID-WEST ABRASIVE CO.

Executive Offices: 510 So. Washington St., Owosso, Mich.
Factories: Owosso, Mich., Rochester, Pa.

MID-WEST QUALITY ABRASIVES

CIRCLE INFORM-A-GRAM KEY NO. 112

Lightweight drill templates for contoured sheet metal parts can be fabricated from laminate plastic—using imbedded Anchor Drill Bushings designed for this purpose. Templates are shaped in the same die forms that produced the sheet metal



parts to be drilled, thus assuring a perfect match with the contoured parts. They permit substantial savings in tooling for drilling operations. Standard triangular and rectangular flanged bushings range in drill sizes from #55 (.052) through "F" (0.2570) Catalog is available. The Hi-Shear Rivet Tool Co., 8924 Bellanca Avenue, Los Angeles 45, Cal.
Circle Inform-A-Gram No. P3.

Color matching and control in working with plastics is a fascinating but exacting science. Here is a story that takes you step-by-step through a plastics producer's Color Laboratories, as a sample is matched in Koppers Polysterene. Then follows a detailed discussion of the science of color, color measurement and specification, color difference and tolerance. Send now for "Color in Plastics". Koppers Company Inc., Pittsburgh 19, Pa.
Circle Inform-A-Gram No. P4.

High-strength structural plastic now available is Conolon, a lightweight glass fabric reinforced resin plastic. Three fabric weaves and several resin formulations permit a selection to suit many diversified applications. Uncured impregnated cloth comes in rolls, can be cut to shape and, using a wide variety of low-pressure molding techniques, "cured" to a hard infusible state by final exposure to controlled heat and pressure. Technical bulletins available. Narmco Resins & Coatings Co., 600 Victoria St., Costa Mesa, Cal.
Circle Inform-A-Gram No. P5.

IN PLASTICS?

- *Plastics Fabrication*
- *Plastic Tooling*
- *Plastics Molding*

Effective release of epoxy laminates and castings from metal or plaster molds is provided by new release agent, H-561-B. Epoxy resins, noted for their outstanding ability to bond metals, ceramics and glass, have in the past tended to stick to mold surfaces and release with considerable difficulty. Further information is available from Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Cal.
Circle Inform-A-Gram No. P6.

Controlled compression-molding of glass mat reinforced plastic is accomplished on the Dake 50-ton, guided-platen hydraulic press. Equipped with electric heating elements and automatic timing device,

press is started up by pressing dual palm switches. Pressure on workpiece is held automatically for any predetermined cure period, and platen then returned to starting position. Write for detailed information. Dake Engine Company, Grand Haven, Mich.
Circle Inform-A-Gram No. P7.

Non-shrink laminating resins now being introduced, are designed specifically for use with glass reinforcing in such tooling as jigs and fixtures, models, prototypes, and molds. Toolplastic L-900 and Toolplastic Gelkote L-910 are modified epoxy resins with 100% solids content. They are easy to handle, apply and cure at room temperature. Gelkote L-910 produces a high glass surface on form tools and may be used for the surface layer, backed up by reinforcing glass fabric and L-900. A Laminating Kit, containing all necessary materials for an experimental tool, may be obtained at the nominal cost of $15.00 from Rezolin, Inc., 5736 West 96th St., Los Angeles 45, Cal.

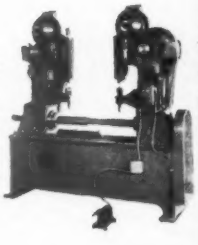
Safer, more economical handling and heating of hot strippable plastic coatings is provided by Aeroil processing tanks for heating, melting, and dipping Ethyl cellulose, cellulose acetate butyrate, waxes, parrafins oils, and other compounds. Ask for new Bulletin No. 440. Aeroil Products Company, Inc., Wesley St., So. Hackensack, N. J.
Circle Inform-A-Gram No. P8.

Comprehensive 78-page manual deals with phenolic casting resins, their uses in tooling and end products, methods of casting, preparation of molds, machining and finishing of cast phenolic products. Profusely illustrated, the "Marblette Manual" includes numerous detailed procedures. The Marblette Corp., 37-27 Thirtieth St., Long Island City, N. Y.
Circle Inform-A-Gram No. P9.

Speed Production... Automatically with T-J

RIVITORS

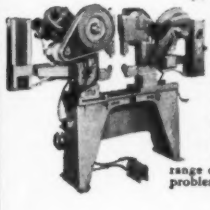
T-J RIVITOR used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembling, setting, inspecting and ejecting.



DOUBLE RIVITOR sets two rivets at a time! Equipped with 10" hoppers, and tooled to automatically feed and set two ¼" dia. x ⅝" long wagon box head rivets at a time in elevator chain and raddle or elevator flight assemblies for farm implements. Controlled by one foot pedal.

CLINCHORS

T-J CLINCHOR . . . one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets 11/16" square cased nuts in outside quarter panels, left and right hand.



DOUBLE CLINCHOR sets two nuts at once! Tooled to feed and set ⅜" x 3/16" x 5/16" thick Fabri-Steel nuts at each operation. Both Clinchors tripped by same foot-operated valve. Adaptable to wide range of clinch nut setting problems.

Boost production . . . save labor with T-J Rivitors and Clinchors for many assembly jobs today . . . in aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts 3 to 5 times faster! Fully automatic . . . controlled by a single foot pedal! Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets . . . with high production! Electrically-powered Rivitor sets 1/16" to ¼" diam. solid steel rivets up to ⅜" long. Air-powered Rivitor sets aluminum alloy rivets up to ¼" diam. or steel rivets up to ⅛" diam. and up to ¾" long. Throat depths 8" to 36".

37 YEARS EXPERIENCE

Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

T-J
TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

CIRCLE INFORM-A-GRAM KEY NO. 113

REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

CAST IRON HAND WHEELS
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Made of fine grain cast iron. Center hole and faces of hub are true to rim. Rims and handles are ground and polished to high lustre. Top quality. Low prices. Many sizes. Immediate delivery. Alterations when required at nominal prices.

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REID TOOL SUPPLY CO. Muskegon Heights, Mich.

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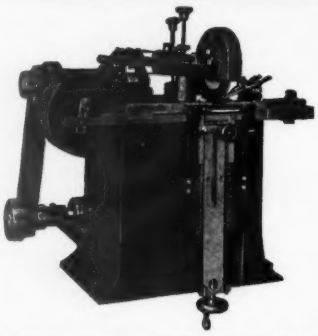

Wardwell Model EC Combination Grinder. The only single unit grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. ● This unique feature enables operator to grind a variety of blades without dressing or changing wheels.

sharpening 1 gross of hack saw blades PAYS for this machine!

One gross of hack saw blades can be resharpened at least 6 times—actually saving you the price of the machine!

Wardwell EC Grinder gives old blades a keener, longer lasting cutting edge—because new blades are usually not ground after hardening.

Wardwell EC wheels will not burn, anneal or injure hardness of teeth. Sharpen Circular, Hack or Band Saw blades on one machine!

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Complete Wardwell Catalog describing more than 30 grinding, sharpening, setting and swaging machines also available.

THE WARDWELL MANUFACTURING CO.
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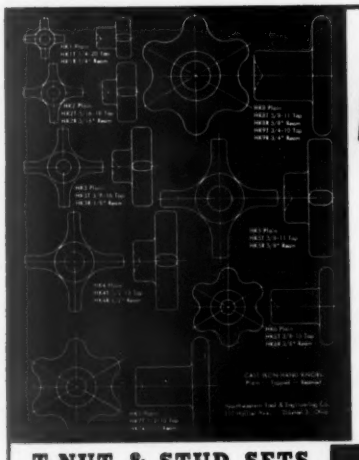
CIRCLE INFORM-A-GRAM KEY NO. 114B



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T-NUT & STUD SETS
STEP BLOCK SETS
PUNCH PRESS SETS

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 114C

. . . Ultrasonic, from page 80

scan, a graph of echo height vs. the time the ultrasound takes going into and back out of the metal. This graph gives information as to the depth at which the flaw lies below the surface, and it also gives some data as to the amount of ultrasound reflected by the flaw. The strength of echo information is unique to the A-trace.

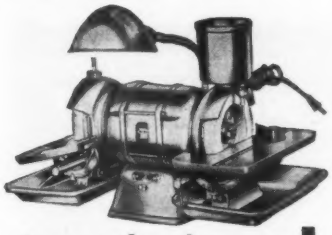
The cathode ray tube that draws the A-trace shows echo height and depth into the metal. Additional data could be shown only by changing the brightness of the cathode ray beam. This cannot be depended upon to present much more than off-and-on information.

Another type of presentation is the "B" scan, a drawing—on a TV screen or on some recording media—of the cross-section of the metal being inspected. The vertical axis represents the thickness of the metal or depth to the flaw, and the horizontal axis is one of the dimensions of the metal being inspected. The cross-section view aids in estimating the position of the flaw relative to the top and bottom of the metal. It also assists in detecting small inclusions or voids that tend to form into flow lines or planes.

The B-scan view does not contain complete information as to the strength of the echo that was returned by the flaw. Some half tone information can be presented that makes possible the showing of grain and other small discontinuities. This is obtained by electronic circuits that tend to quantatize the incoming echo amplitude data.

It is signficant that the limited ability of the B-scan presentation to show detailed echo amplitude data does not seriously impair the usefulness of the method. This is due to the fact that once ultrasound is inside the metal being inspected, any echo above some preset height is interpretable as a discontinuity. The operator can tell from the dimension of the discontinuity as measured from the TV screen whether to reject the metal. This method of grading metal is no more invalid than using an echo height standard, since the latter does not take into account the angle from which the flaw was seen, the attenuation of the ul-

. . . Continued on page 144



Accurately sharpens CARBIDE TOOLS

BALDOR Grinder No. 500 — Built especially for sharpening carbide tools quickly and accurately.

Reversible ½ h.p. capacitor type motor, 3450 rpm; heavy shaft, large ball-bearings. Dynamically balanced armature. Motor withstands repeated over-loads. Protractor at each end of grinder; water pot and pans, moveable light, guards and tool-rest tables.

Complete, as shown
$149.20

ASK FOR BULLETIN 321-H

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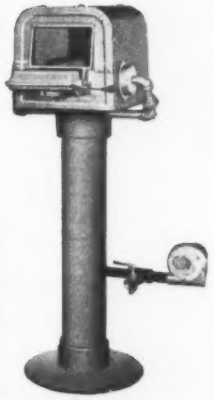
CIRCLE INFORM-A-GRAM KEY NO. 115A

SPEED PRODUCTION

ELIMINATE DELAYS with Quick Acting JOHNSON Furnaces

Heat treat high speed steels
Harden high carbon steels
Braze carbide tipped tools



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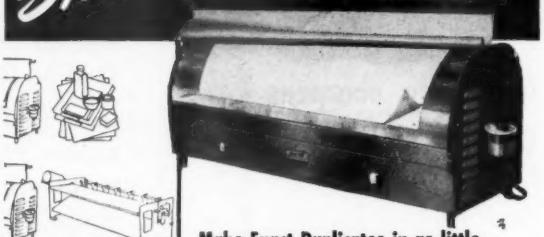

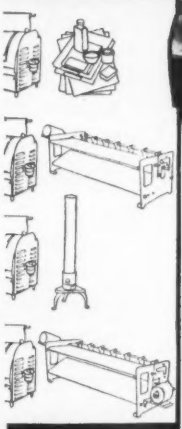

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Machine Tool Fossils

The mass-production industries of the United States, which three times within a single lifetime successfully have defended the free world, are today far from as efficient as they think they are.

Speaking in Indianapolis before the American Society of Tool Engineers, Tell Berna, general manager of National Machine Tool Builders' Association, reported that more than 20 per cent of the machine tools on the production lines of the nation are today more than 20 years old.

"A machine tool built that long ago is a fossil today," Berna pointed out.

"America's manufactured abundance depends upon machine tools, which are basic to everything we need and use in modern civilization. They are constantly being redesigned for greater production.

"Machines 20 years old, for example, cannot make full use of modern cemented carbide cutting tools, which were developed in the late '30's and which enabled the nation to meet World War II production goals with a third fewer machine tools than otherwise would have been possible.

"The nation-wide survey by American Machinist in 1950 showed there were 370,000 machine tools over 20 years old on the production floors of American industries, or 21% of the total 1,762,000 machine tools," Berna stated.

"At our rate of production of new, modern machines which was 97,000 in 1952, it would require nearly four years merely to replace these obsolete machine tools.

"The machine tool industry, one of the smallest in number of employees in the nation's great industrial team, has been one of the most competitive.

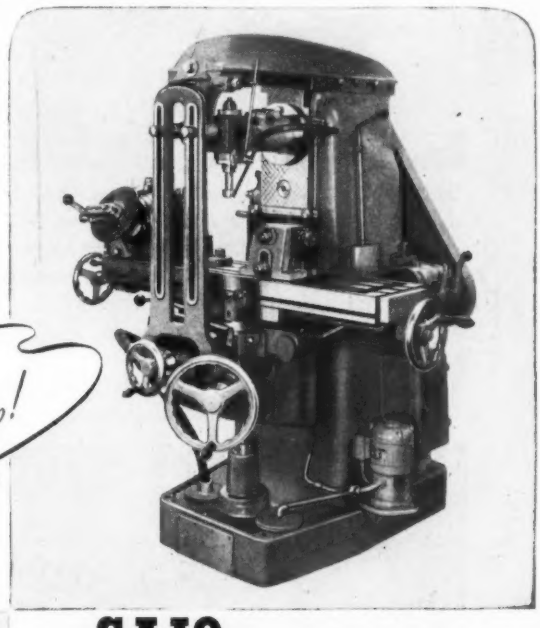
"Each company is constantly busy designing new and more efficient machines to keep ahead of every other company in the field, and as a result there has been a double surge ahead, the first after World War II and the second as a result of Korea.

"Notwithstanding some recently completed plants that are magnificently equipped, the greatest threat to survival and success in the nation today is a reliance upon obsolete machine tool equipment which is not worth the floor space it occupies in terms of today's efficient production.

"Only the industries in Germany, which profited by replacing machine tools taken from them by the Russians and the French with the newest American machines bought with American dollars, are well tooled today. These industries will be serious competitors to American mass-production industries for the years ahead.

"Obsolete machine tools have today become a serious threat to the stability of our national economy, for in the United States wages have been advancing far more rapidly than replacement with efficient tools for production, and inflation has thus been increased," Berna stated.

Berna pointed out that machine tools today work to far closer limits than ever before, and that the resultant efficiency is the nation's best insurance of success and survival.



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ Standard Equipment includes:
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ Extra Equipment:
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41½" x 9¼"
Longitudinal travel: Plain Miller	24½"
Universal Miller	27½"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

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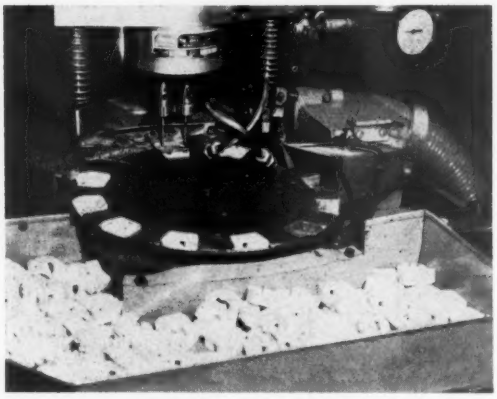
DEALERS IN PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 117

. . . Standard Units, from page 62

time while the tapping head descends, taps the two holes, reverses and retracts to its starting position. The table then indexes to the next station into tapping position. While this part is being tapped, a blast of air ejects the piece just previously tapped into a chute leading to a container under the machine.



Should the operator load a block that does not drop squarely in the station recess and it advances in a tilted position, the machine is equipped with a plate to which a Micro switch is connected. As the tilted part strikes this plate the Micro switch is actuated and stops the machine.

This operation was formerly performed with a tapping head and a Bellows Press feed, but

the addition of the rotary table feed has increased production between 25 to 30%. In addition to this increase, full 75% threads are now obtained, which are well within the specified tolerances.

The machine has been in operation about two years and produces an average of between 2200 and 2400 pieces per hour.

. . . Automatic Control, from page 60

the rotor diameter being 9.25". The three rotor sections have poles .202" wide and 6" long, each, and of course the stator poles are similar in dimension. Under test, the motor has shown more than 3,000 inch pounds of pull-out torque.

It is obvious that an accurate combined indexing and power motor of the kind described can be used for many purposes as, for instance, in many operations requiring synchronized, or definite displacements, like telemetering, synchronized gun pointing, in textile and paper mill drives, in airplane controls, computers, guided missiles, valve controls, and innumerable others.

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SAVINGS BONDS**

An interesting application of the system is in automatic machine tool control. As an illustration, information corresponding to a desired shape in three dimensions is put on the tape by punching, printing, magnetizing, or in other manner, and the tape is run through a photoelectric or other sensing unit which controls three step motors attached to a milling machine. One motor controls the lifting and lowering of the cutting tool, and the other two motors control displacements of the workpiece along perpendicular axes in the horizontal plane. The gearing between the motors and the tool carrier or tables can be such that one step movement of a motor causes a cut of 0.001", or much less, if desired. The accuracy can be pre-set. The tape can be run through the sensing unit hundreds or thousands of times, and every three-dimensional workpiece automatically shaped by the milling machine will be like every other piece produced — within the limits of the predetermined accuracy.

Similarly, lathes, presses, grinders, borers, and other machine tools can be automatically controlled by a tape or similar record, and indexing, transfer, and feeding operations can in like manner be made automatic.

Any number of machine tools can be operated in multiple, controlled by one tape which can be placed near the machines or at any desired distance away. This special step motor and control system make it possible to provide fully automatic control for many applications which have in the past been manually operated.

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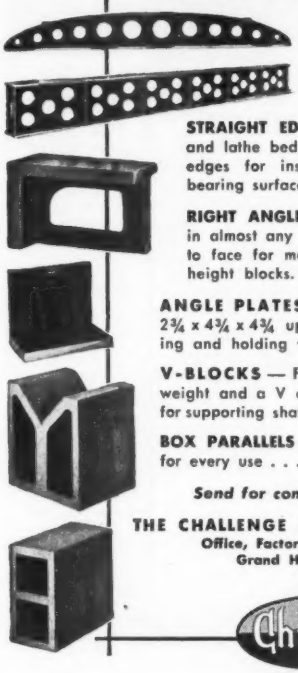

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CIRCLE INFORM-A-GRAM KEY NO. 119A

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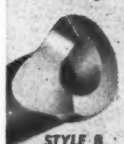
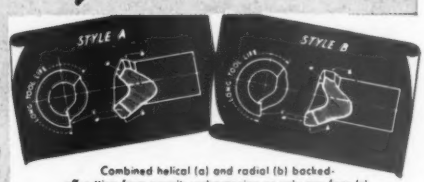
are *Designed* for boring

STYLE A for general boring



STYLE B for bottoming and facing

STYLE C for internal threading



Combined helical (a) and radial (b) backed-off cutting form permits resharpening on only one face (c)

Design is based on a *mathematical formula* which guarantees correct cutting and clearance angles anywhere around the periphery of cutting head—maintained uniformly within limits of ± few minutes of 1°.

Bokum tools are available in 3 cutting materials: (2) carbide tipped, Cat. 398; (3) solid carbide, Cat. 948.

In range of sizes to bore holes from 1/16" dia. up.

To extend further the already long life of Bokum Tools, we recommend the Resharpening Fixture. Cat. AB1 and AB412. Tool holders, vertical adjustment and fixed position. Cat. 483.

Because Bokum Boring Tools are designed, they are uniform and remain uniform

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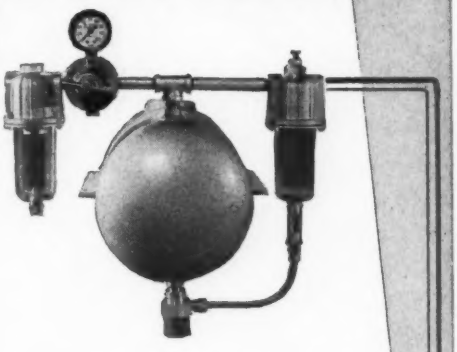

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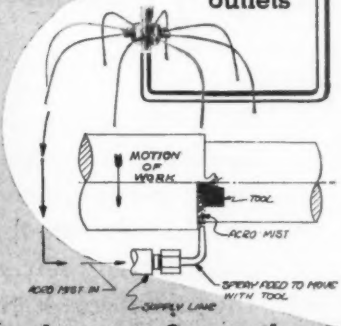

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HERE'S TO *Happy Holidays*

With the happy holiday season upon us we rise to the occasion for a toast to our good customers and friends who have so loyally contributed their part to make the year pleasant and profitable. So here's to you with our best wishes for a

Merry Christmas and Happy New Year

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CIRCLE INFORM-A-GRAM KEY NO. 120C

Production Power Tube Flarer

A new power tube flarer has been designed and is now being produced by a manufacturer who for more than thirty years has produced tube forming tools and is widely recognized as a leading manufacturer of industrial and aircraft hydraulic system components.

The new unit was conceived to put tube flaring on a high-volume production level. Need for production flaring is gradually becoming more critical among manufacturers of instrument panels, tools, machines and others whose products or plant operations involve extensive fluid handling tube circuits.

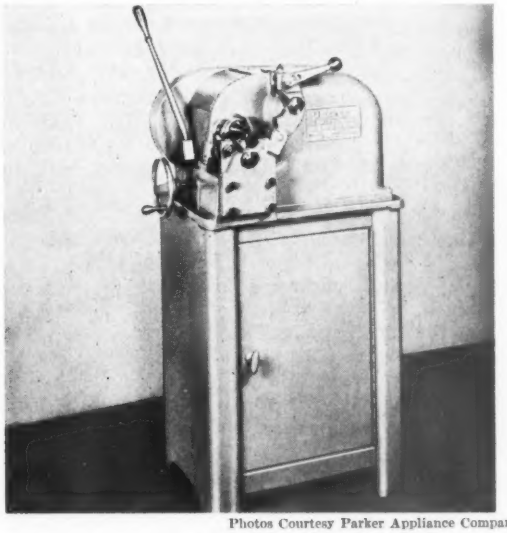
Service Performed

Designated Model 232A, the new unit produces perfect, concentric, smooth-surfaced, 37° tube flares for use with standard Triple-lok and AN tube fittings. The flares meet the following standards: AN, JIC, SAE Hydraulic and ASME.

The machine will flare the full range of standard tube wall thicknesses and all tube sizes from ⅛" through 2" outside diameter.

Annealed seamless copper, aluminum, steel and stainless steel tubing are handled with ease.

In addition to flaring, the unit, by virtue of readily interchangeable heads and accessory attachments, can be used for square-burring of tubes. For square-burring, the unit will handle tube sizes ranging from ⅛" through 2" outside diameter.



Photos Courtesy Parker Appliance Company

Fig. 1. The powered tube flarer is finished in machine tool gray paint. The cabinet stand, flaring center, clamp blocks square-burring head and squaring-burring blades are accessories furnished on order.

Design and Operation

The design of Model 232A incorporates maximum simplicity and minimum maintenance requirement. Major working elements of the power flarer are: flaring center; spindle stops; vise and clamp die blocks; stop finger; and variable-speed control.

Flaring Center: The flaring center, which contains an eccentrically located flaring cone, fits into the spindle head. The spindle head has one index mark, while the flaring center is graduated with tubing sizes. Matching the tubing size graduation to the spindle mark gives the proper off-center location of the flaring cone with respect to tube center. This positioning insures rapid, perfect flares in any tube size from ⅛" through 2" outside diameter.

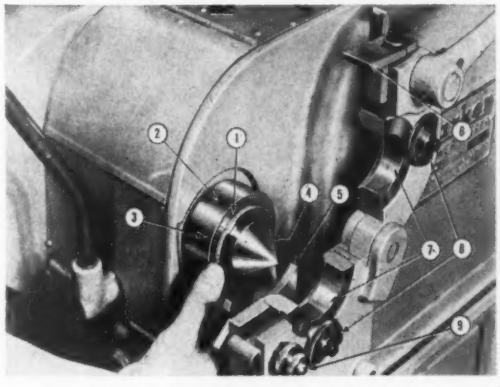


Fig. 2. Identity of working components of the powered tube flarer are: (1) flaring center; (2) spindle head; (3) scribed index line on spindle head; (4) spindle head set screw (hidden from view); (5) finger stop; (6) vise-locking hook screw (7) clamp die blocks; (8) circular lock keys to hold clamp blocks; and (9) finger stop adjusting screw.

When set, the flaring center is screw-locked in the spindle head and is ready for production.

Spindle Stops: The forward travel of the spindle for flaring is regulated by simple adjusting screw dial nuts on a threaded rod. The rod is under a housing lid by the spindle lever and is readily accessible.

Vise and Clamp Die Blocks: Tubing is clamped in position for flaring by a lever-operated, hinged, circular vise. A hook screw insures locking of vise with only slight hand pressure on the lever. Clamp block sets are available for each size, each marked with the tube size it accommodates. These blocks slide into the channels of the vise jaws and are made secure by circular lock keys. The blocks are high-finish steel and will not mar the tubing.

The clamp blocks act as the 37° die against which the driven cone forms the tube flare.

Stop Finger: Adjoining the inside of the lower vise jaw is a stop finger which is used to limit the extent of the tube beyond the vise toward the cone. A simple adjustment screw regulates the finger's distance from the vise. The tube, when positioned in the vise for flaring, is placed flush against this finger. The finger retracts automatically as the vise is closed and is spring-returned to its original position as the vise is opened.

Variable-Speed Control: Power source of the flarer is a 110v a-c, 1/3-hp motor. A variable-speed pulley arrangement connects the spindle to the motor. Speed adjustments—to insure best results with various wall thicknesses and tube materials—are made by turning crank.

Set-Up and Production

Set-up of the power flarer for production requires simply: insertion, indexing and locking flaring center; insertion of vise clamp blocks; posi-

. . . *Continued on page 123*

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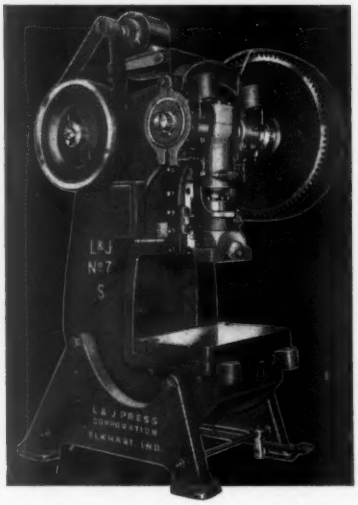

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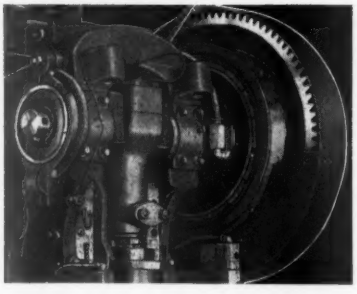

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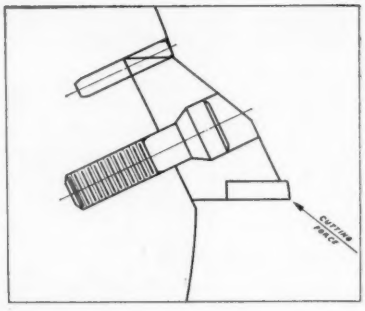
CIRCLE INFORM-A-GRAM KEY NO. 122

New Attached Blade Milling Cutter

Something entirely new in milling cutter design has been developed to compliment the common solid body and inserted

blade type cutters now on the market. This is a new "attached blade" type milling cutter.

A primary advantage of the Millit attached blade design is its complete blade rigidity. It combines the advantages of the solid body and inserted tooth type cutters by providing a replaceable blade with maximum tooth rigidity or minimum tooth deflection. This rigidity is obtained by seating the replaceable blade on the periphery of



the cutter body against a body abutment that takes all cutting forces. The blades are accurately doweled in place at two points. The cap screw shank dowels into a reamed hole to locate the blade and combines with the conical seat to accurately cam the blade back against the body abutment. A dowel through the body abutment holds a slot in the tail of the blade and accurately locates the tail laterally.

A second advantage of the Millit design is that rake and shear angles are built into the blade instead of being built into the body slot. As a result Millit bodies can be rebladed for all types of service. A change from stagger tooth construction to side mill construction is accomplished by a quick change of blades. Blades are also available with customer choice of carbide, H.S.S. or cast alloy tips, each with proper rake angles built into the replaceable blades.

MILLING CUTTER COMPARISON CHART

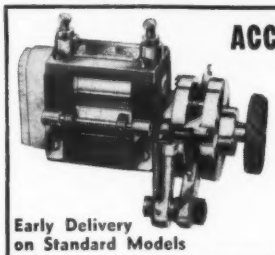
	SOLID BODY	ATTACHED BLADE	INSERTED BLADE
INITIAL COST	Low	Intermediate	Depends on design, generally, most expensive
REPLACEMENT COST	High	Low	Low
BLADE RIGIDITY	High	High	Depends on design, but always least
BODY STRENGTH	Low	High	High
SIZE ADJUSTABLE	No	No	Yes
CHANGEABLE RAKE ANGLES (to cut different materials)	No	Yes	No
CHANGEABLE CUTTING TIP (H.S.S., Cast Alloy, Carbide)	No	Yes	Yes

. . . Tube Flarer, from page 121

tioning stop finger; speed adjustment; and finally spindle travel setting with dial nuts. An operator after short experience with the machine can set up in less than five minutes.

Once set-up, the unit is ready for production flaring. For each flaring, the operator simply places the tubing against the stop finger, closes the vise, and thrusts the spindle hand lever forward.

Weighing approximately 158 pounds, the machine is finished in a machine tool gray paint. The cabinet stand, flaring center, clamp blocks, square-burring head and squaring-burring blades are accessories furnished on order.



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PERFORATING PUNCHES

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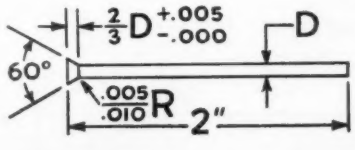

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anywhere . . . in one easy motion!

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NEWAGE (CANADA) LTD., 1174 BAY STREET, TORONTO
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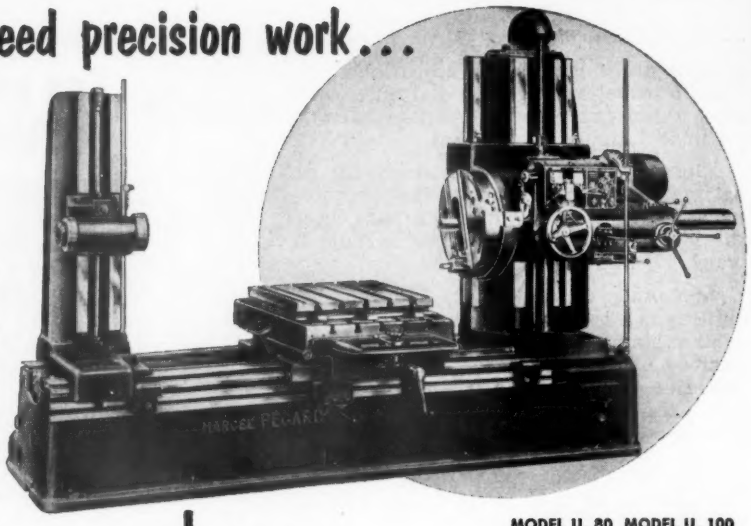

PARTIAL SPECIFICATIONS

	MODEL U. 80	MODEL U. 100
Spindle diameter	3 5/32"	3 15/16"
Spindle traverse	31 15/32"	39 3/4"
Spindle speeds	18	18
Facinghead speeds	6	9
Long. traverse of table	51 3/16"	63"
Motor	7 HP	13 1/2

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GREATEST COST SAVER IN METAL CUTTING

Tremendous savings of time and money are effected in trimming formed parts with Tannewitz High Speed Band Saws, for not only are the cuts made exceedingly fast, and smoothly, but in most cases no jigs or rests of any kind are required. Sheets of both hard and soft steel, and even such metals as 1" armorplate are handled with great advantage by this method, and it is ideal for trimming malleable and steel castings. By all means get the complete facts and learn of the many opportunities for boosting production and lowering costs that Friction Sawing with Tannewitz High Speed Band Saws offers. Write for circular.

for trimming castings of all metals write for bulletin on "Foundry Band Saws".

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PROGRESS ON PARADE

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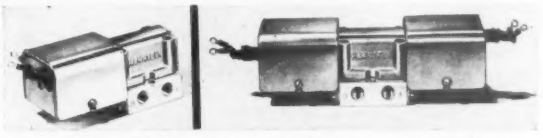
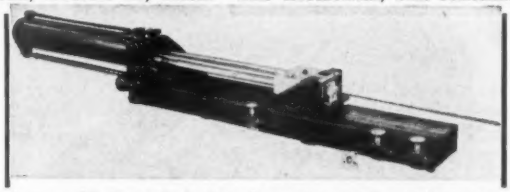
Solenoid Operated 4-Way Valves. These new 4-way poppet valves are extremely compact, simple and very fast. They are recommended for speeds as high as 600 cycles per minute and their principal use is for electronic control of small double-acting air cylinders on



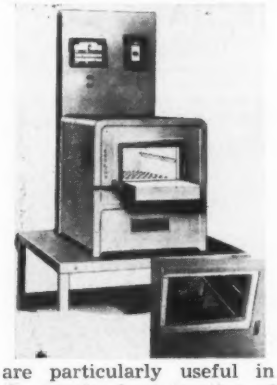
short stroke, high speed applications. Examples are switching mechanisms for conveyors, welding cylinders and clamping and work positioning cylinders on various automatic and semi-automatic machines. Further information is available from the Hannifin Corp., 1164 S. Kilbourn Avenue, Chicago 24, Ill. **Inform-A-Gram No. A1.**

Air Powered Broaching Fixture. Designed to cut broaching equipment costs and speed delivery is this new versatile air-powered broaching fixture manufactured by the National Broach and Machine Co., 5600 St. Jean, Detroit 13, Mich. The horizontal, self-contained



fixture will broach holes, keyways and contours on a wide variety of production parts. It has a 1,400-lb. broach pull capacity with an 80-psi air line pressure. **Inform-A-Gram No. A2.**

Draw Furnaces. Recirculating air draw furnaces with chamber sizes of 8" x 6" x 14" and 12" x 8" x 18" have been announced by the Cooley Electric Mfg. Corp., 38 S. Shelby St., Indianapolis 7, Ind. These furnaces



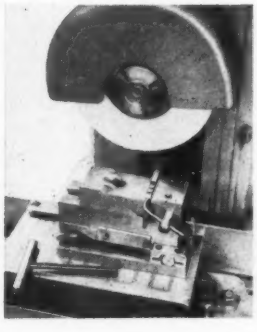
are particularly useful in the precise heat treating of rivets for airplane assemblies and repairs and to any aluminum fabrication in which closely controlled heat treatment is necessary before assembly. The manufacturer has data on hand. **Inform-A-Gram No. A3.**

Lapping Machine. A new, easy-to-use, precision flat lapping machine that speedily produces a fine microinch finish has been developed by the Spitfire Tools Co., 2931-35 N. Pulaski Rd., Chicago 41, Ill. This machine is particularly suited for such

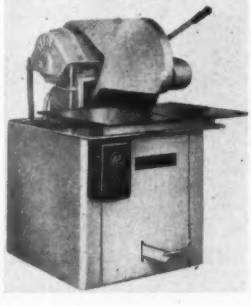
pieces as sliding or rotating parts, gages, air tight or liquid-tight seals and valves, measuring valves, measuring devices, load carrying bearings, plastic and die casting molds and other surfaces which must be held to extreme tolerances of flatness and smoothness. Full details on this and other Spitfire models will be sent upon request. **Circle No. A4.**

Portable Positioner. Here is the new safety engineered Gonser portable positioner in action. Designed for lifting plates, weldments, castings and all heavy machinery and equipment, the portable positioner is a

product of the James Campbell Smith Co., Inc., Willoughby, Ohio. It is a special tool that combines wedge, screw and toggle to form a powerful and safe gripping unit. The tool eliminates chains, pry bars, ropes, eye bolts, blockings and "C" clamps. **No. A5.**



Work-Holding Device. A new vise, designed for precision grinding, and square within 0.0001" or less in 1", in 4 positions has an adjusting stop and hold-down feature which gives dependable, accurate positioning of workpieces. Also featured is a hold-down clamping action. Write to J & S Tool Co., Inc., 644 W. Mt. Pleasant Ave., Livingston, N. J. **A6.**



Heavy Duty Cut-Off Saw. Great versatility is provided by the new heavy-duty all purpose saw made by the Henry H. Wise Co., 945 Wilshire Blvd., Los Angeles 7, Calif. The saw can be adapted to cutting gates and risers or to a chop-stroke operation for cutting bars and shapes. Literature available. **Circle No. A7.**

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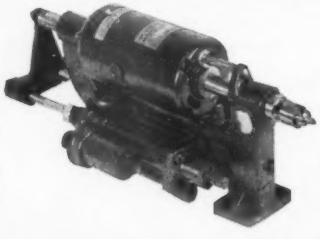
SMALL HOLE DRILLING SPEEDED AUTOMATICALLY

. . . and at low cost with Electro-Mechano compact drill units. Typical set-up above is used by a Racine screw machine company; four units drill #50 holes in stainless steel fuel nozzle caps. Production was increased from 40 to 190 pieces per hour.

These fast acting complete drill units speed up many simple drilling jobs and simplify complicated multi-spindle jobs. Direct electric motor drive variable speed spindle provides 1000 to 10,000 or 2500 to 15,000 RPM; employs economical air feed with adjustable hydraulic control. Supplied in pad and column mount, with manual, electric or automatic trip; drill cap. .004" to .156". Precision sensitive bench and floor models available up to ½" cap.



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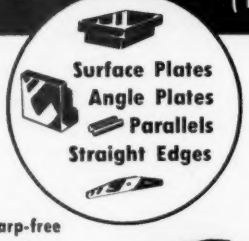

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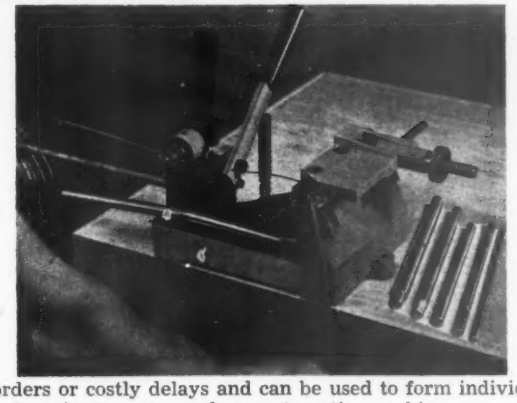
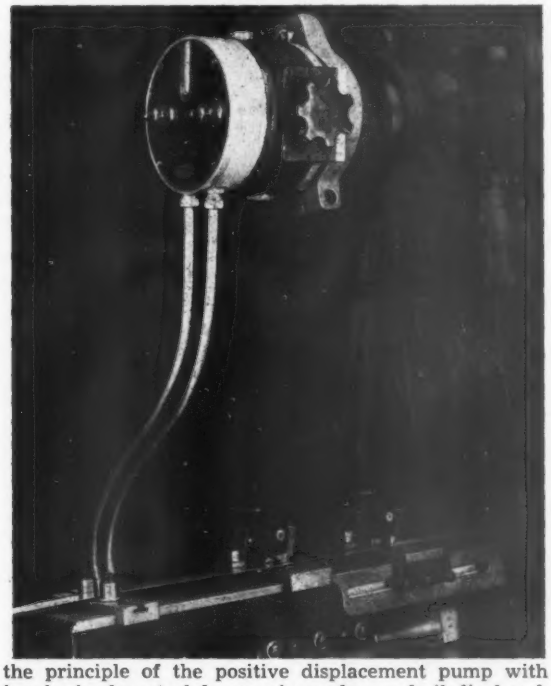
CIRCLE INFORM-A-GRAM KEY NO. 126D

Spring Winding Machine. The O'Neil-Irwin Mfg. Co., 626 8th Ave., Lake City, Minn., reports the addition of a new spring winding machine that can be operated without any experience or special skill. It is a complete self-contained unit with a special cut-off lever incorporated. The winder is designed to eliminate special



orders or costly delays and can be used to form individual springs or to replace automatic machines on expensive short run production. Any gage wire to ⅛" diameter can be wound into extension, compression, torsion and flat springs. Round, flat, square or rectangular shaped stock can be formed into springs of any length. The spring winder is equipped with six arbors in ⅛", ¼", ⅜", ½", ⅝" and ¾".
Circle Inform-A-Gram No. A8.

New Hydraulic Feed. Attached to this punch press is an automatic coil and strip stock feed with radically new design features that enable it to be used over an extremely wide range of press operations. The feed uses



the principle of the positive displacement pump with hand-wheel control for varying volume of oil displaced. The tool can also be used on any machine having a shaft extension 1½" dia. or larger, by 3" overhang and revolving at 1:1 ratio with work cycle, i.e., power shears, sheet metal brakes and various types of coating machines. Further information can be obtained from Jaco Devices, Inc., 96 High St., Hingham, Mass.
Circle Inform-A-Gram No. A9.

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9 SIZES

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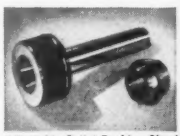
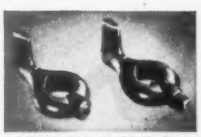
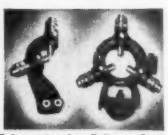
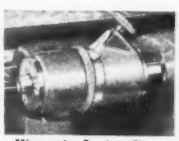

Adjustable Collet Bushing Chuck

Steel and Brass Collets


Safety and Standard Lathe Dogs


Telescoping Jaw Follower Rest and Center Rest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Ball Bearing Live Center

10 in 1 Tool Holder

Thread Dial Indicator

External Grinder

Centers, Drill Pads

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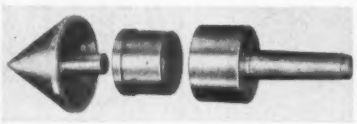
South Bend 22, Indiana

CIRCLE INFORM-A-GRAM KEY NO. 128A

Live Center. Old style lathes can be made more efficient and productive through the use of Jergens live centers incorporating Jergens pilot bearing bushings. This new development allows the use of carbide tools

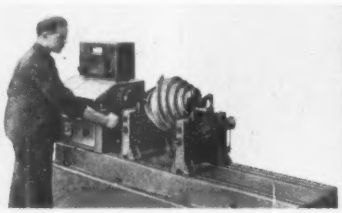


in older equipment and withstands heavy thrust loads while maintaining extreme precision. The live center pictured has a No. 4 Morse taper shank and 4" I.D. capacity nose. For additional information write to J. C. Jergens Co., 11106 Avon Ave., Cleveland 5, Ohio. **Circle No. A10.**

Cutter Grinder. This is the improved Mico Cutter Grinder and it features such items as a separate grinding wheel spindle assembly

that permits the use of pre-loaded ball bearings which are shielded and greased for long life. For further information write for catalog to Mico Instrument Co., 88 E. Trowgridbe St., Cambridge, Conn. **Circle No. A11.**

Balancing Machines. Nine different models of Schenck, electric-dynamic, balancing machines are now being marketed in the U. S. by the Cosa Corp., 405 Lexington Ave., New York, N. Y. In less than a minute, in a single run, these German-made machines accurately determine the amount and location of dynamic and static unbalance in rotating parts. The various models have weight



capacities which range from a few ounces, in the smaller machines, to over 100 tons. Each balancer has an electrical measuring system, without electronic tubes or oscillograph, that will indicate unbalances caused by displacements of as little as 0.00004" from the center of gravity. Write to the Cosa Corp. for further information.

Circle Inform-A-Gram No. A12.

HAND CONTROLLED

Di-Profiler

Makes the toolmakers work easier—takes the "Hard Labor" out of hand work.

The Di-Profiler is a new multiple action tool that (1) Reciprocates (2) Oscillates and (3) Rotates when used with the spindle attachment. Stroke is adjustable from 0" to ¼".

It files, hones, polishes, laps, chafes and saws materials ranging from carbide tools to soft materials. The only machine of its kind. Write for full details and price list today.

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CAMS

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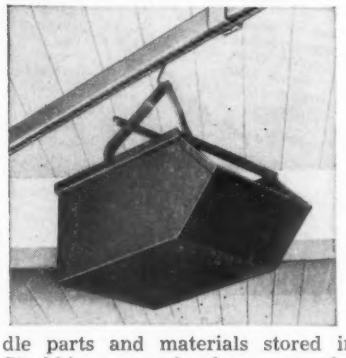
CIRCLE INFORM-A-GRAM KEY NO. 128E

Industrial Hot Plates. A new model of laboratory and industrial hot plate has been added to the line manufactured by the Thermo Electric Mfg. Co., 474 Huff St., Dubuque,

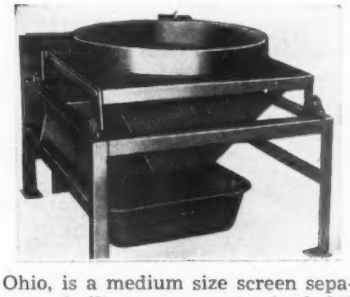
Iowa. The firm now has five sizes of the plates from 6″ x 6″ to 12″ x 24″. The new model 2500 offers precise thermostatic control and is of sturdy lasting construction. A leaflet describing the hot plates is available.
Circle Inform-A-Gram No. A13.

Conveyor Hanger. Designed especially for patented Stackbin hopper-front bins, a new conveyor hanger has been put on the market by the Stackbin Corp., 1223 Main St., Pawtucket, R. I. It permits users to han-



dle parts and materials stored in Stackbins on overhead conveyors for faster, cheaper transportation between storage and assembly. The hangers are easily attached and can be locked securely in place without the use of tools.
Circle Inform-A-Gram No. A14.

Screen Separator. The latest addition to the line of industrial equipment made by the Rampe Mfg. Co., 3320 St. Clair Ave., Cleveland 14,



Ohio, is a medium size screen separator built to use a standard 24″ diameter foundry riddle. It is operated by a ball bearing A.C. motor through a novel designed nylon eccentric bushing.
Circle Inform-A-Gram No. A15.

Men who had to "lick" the many problems you're facing designed... **ROUSSELLE PRESSES**

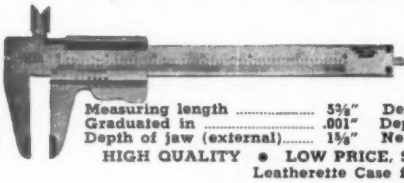
That's why they're fast, accurate, so adaptable, so easy to operate. Why maintenance is simple. Why initial cost is low . . . Often considerable savings and improved punch press operations are possible if you let our engineering staff assist you. There is no obligation. Simply furnish the details relating to your need or problem and if possible send samples or drawings of the work. You will hear from us promptly.

Sold Exclusively Through Leading Machinery Dealers

Rousselle Presses are Manufactured by
SERVICE MACHINE CO.
7627-31 So. Ashland Ave., Chicago 20, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 129A

Precision Vernier Calipers



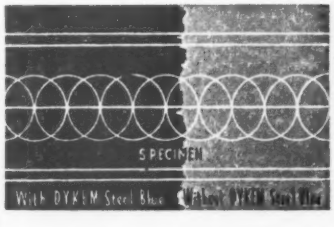
The TUNA Precision Vernier Calipers are made of best Swedish steel with hardened measuring surfaces.

Measuring length	5⅜″	Depth of jaw (internal)	⅝″
Graduated in	.001″	Depth of measurement from	0 to 5⅜″
Depth of jaw (external)	1⅝″	Net weight	5 ounces

HIGH QUALITY • LOW PRICE, $11.75 • IMMEDIATE DELIVERY
Leatherette Case for Calipers, $1.00

SWEDISH GAGE CO. OF AMERICA
C. E. JOHANSSON GAGE CO.—A DIVISION
10641 Haggerty Ave. • Dearborn 1, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 129B



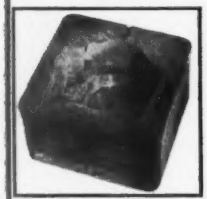
DYKEM STEEL BLUE
Stops Losses in Making Dies and Templates
Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.
Write for full information.
THE DYKEM COMPANY
2303L NORTH 11TH ST. ST. LOUIS, MO.

CIRCLE INFORM-A-GRAM KEY NO. 129C

Specify DESTACO SHIM STOCK
Made from selected steel or brass, rolled to precision limits, oiled to resist stain and rust, free from burrs. Twelve assorted thicknesses .001″ to .015″, sheets 6″ x 12″, coils 120″, identified every 6″ by thickness and amount remaining on roll.
DESTACO DETROIT STAMPING COMPANY
344 MIDLAND AVENUE • DETROIT 3, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 129D

STOP!
HEAT TREATING HEADACHES
SAVE!
HEAT TREATING $$$$$
with the NEW
PHOENIX BRAND
NON-SCALING COMPOUND

Removing scale and polishing heat-treated dies and tools are virtually eliminated with PARKER'S development of PHOENIX BRAND NON-SCALING COMPOUND. Used for many years in PARKER'S own plant, this product is now being offered, *for the first time*, to the industry at large. Application of this compound *(a powder, not a salt solution)*, according to simple, easy directions on the label, prevents decarburization, scaling, pitting, surface film and excessive discoloration in the *hardening* and *annealing* of steels. The most intricate engraving details are *scale-free*, clean and smooth after heat-treating. Many hours spent in polishing are eliminated. These unretouched photographs illustrate the amazing results you can expect.



WITHOUT COMPOUND

Results of normal heat-treating often require hours of expensive polishing to remove scale, pits and decarburization, etc. This can be eliminated.

Result of heat-treating using Phoenix Brand Non-Scaling Compound. Clean, smooth surface — Saves time. Saves labor and money.

WITH COMPOUND

PHOENIX BRAND NON-SCALING COMPOUND ALSO eliminates pack hardening where controlled atmosphere is essential . . . makes it possible to harden different steels of the same hardening range in the same furnace, even though they require different atmospheres.

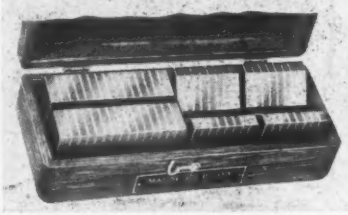
2 lb. can	$ 6.00
5 lb. can	$15.00
15 lb. can	$41.25
25 lbs. or more	$ 2.50 per lb.

Available from your local distributor or

THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

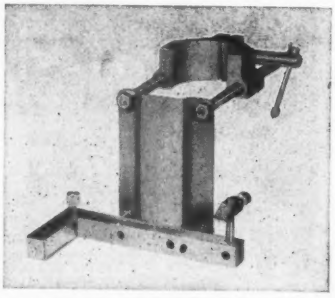
CIRCLE INFORM-A-GRAM KEY NO. 130A

Magnetic Parallels. Completely new mass production methods make magnetic parallels and V-blocks produced by George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.,



available at low cost. This "Magne-Blox" line of parallels and blocks are used as holding devices on the magnetic chucks of surface grinders. They represent a saving in time and labor by simplifying difficult setups. **Circle Inform-A-Gram No. A16.**

A Drill Press Work Guide and Holder to eliminate "C" clamps and other types of fastening devices has been developed by the Walker-Turner Division of Kearney and



Trecker Corp., Plainfield, N. J. Attached directly to the column of the drill press, the safety guide is fully adjustable on the table and is firmly placed in position with one locking screw. Complete descriptive literature available. **No. A17.**

Hand Operated Turret Press. A redesigned and improved hand operated turret punch press that has a punch indexing control for auto-

matic exact positioning of die sets is now being produced. Catalogs on this machine are available from the Diamond Machine Tool Co., 5111 Coffman-Pico Rd., Pico, (Los Angeles) Calif. **No. A18.**

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
1A, 4C
5C
480
(AC-50)
All collets in hexagon, square and round.
KLUTCH-KOLLET
Stop collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND
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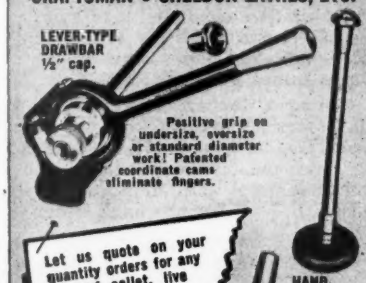
LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.
HAND DRAWBAR ½" cap.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

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Formerly General Die & Stamping Co.
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Integrity Since 1919

CIRCLE INFORM-A-GRAM KEY NO. 130B

KEYWAY CUTTING
WITH
GLENNY Adjustable push BROACHES

STRAIGHT ACCURATE KEYWAYS

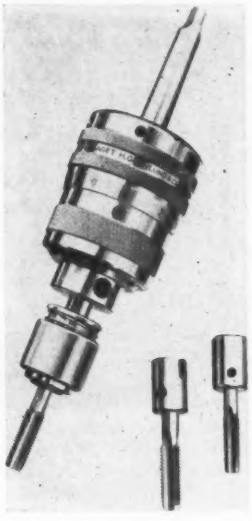
NO SHIMS
NO BUSHINGS

★ Reduce Costs.
★ Eliminate Blade Breakage.
★ Use Under Arbor Press, Hydraulic Press, etc.

(Also One Pass Broaches for Single or Multiple Keyways)

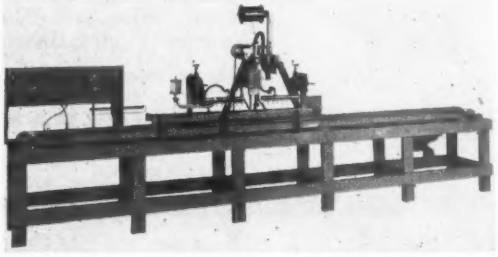
Write for literature
KASE MACHINE COMPANY
18572 BUFFALO AVE., CLEVELAND 18, O.

CIRCLE INFORM-A-GRAM KEY NO. 130C



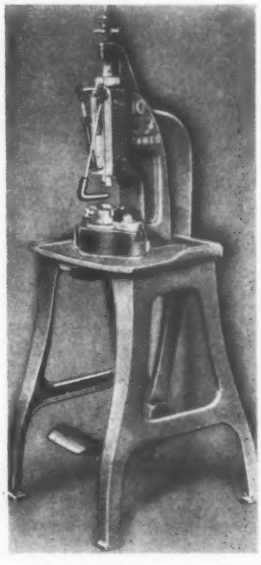
Tapping Attachment. In answer to the problem of costly and time consuming tap breakages during tapping operations, Homestrand, Inc., Larchmont, N. Y., distributors of Swedish "Precisioneered" measuring tools and instruments, has introduced a precision manufactured tapping attachment. It has a graduated sleeve, which permits operators to set the required torque instantly. Transmitted through a sensitive disc clutch, accurate control is gained by turning the sleeve in either direction. In operation, the tap rotates with the same speed as the spindle. When retracted, it reverses itself twice as fast. **Inform-A-Gram No. A19.**

Automatic Soldering Machine. Designed and built as a completely self-contained unit, the Mogul soldering conveyor fixture needs only to be connected to the gas, air and electricity in a plant to be put in operation. Among its many features are an adjustable soldering



horn with movable rails that can be lowered or raised; a master control panel for easy adjustment of the flow of gas and air to the soldering gun; and an automatic fluxing device that applies the necessary flux to the work. The Metallizing Co. of America, 3520 W. Carroll Ave., Chicago 24, Ill., produces the soldering fixture. **Circle Inform-A-Gram No. A20.**

Press Guard. This new, small power and kick press guard operates on the basis of the sweep action of an adjustable guard arm which works with the downward motion of the ram. While the press is not in operation, the guard arm remains entirely out of the operator's way at the extreme left or right hand side of the press. As soon as the peddle is pushed to operate the press, the guard arm sweeps completely beyond the press feed area on half the downward stroke. Thus the operator's hands or fingers are brushed aside before the dies are closed. The Searjeant Metal Products Co., Inc., 71 Pittsford Rd., Mendon, N. Y., will happily furnish additional information. **Inform-A-Gram No. A21.**



Cut Costs

on Tool Room, Development and Mass Production Milling with

U. S. No. 1

HORIZONTAL MILLING MACHINES

Time-proved, shop-proved, profit-proved "U. S. No. 1" heavy duty, hand-feed milling machines are outstandingly America's No. 1 Machine Tool value. Easily adapted to production with automatic devices.

SEND FOR DATA AND SUGGESTIONS

Suggestions as to how a U. S. No. 1 Milling Machine can cut costs on your particular production needs, as well as complete data on the basic machine and attachments, gladly furnished on request.

THE U. S.-BURKE MACHINE TOOL DIV.
Brotherton Road 7, Cincinnati 27, Ohio

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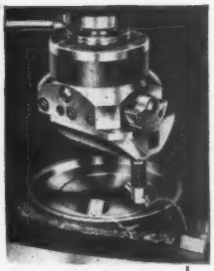
ONE Tool
ONE Set Up

. . . for boring, facing, turning, recessing, undercutting.



MASTERHEAD
THE BORING HEAD THAT THINKS FOR ITSELF

Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; nine models for work up to 36¼" diameter.

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for fast, accurate layout

WRITE FOR CIRCULAR AND PRICES

A new precision height gauge which reads like a micrometer and measures zero flush at base. Has a direct reading of 2" with scriber in upright position, and 3" with scriber reversed.

Replace scriber with dial indicator and Micro-Height Gauge measures center distances between holes or surfaces. As indispensable as a micrometer to toolmakers, layout men, and inspectors.

FAIRFIELD GAUGE COMPANY
170 HERBERT STREET
BRIDGEPORT 6, CONNECTICUT

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Every Punch Press Operator Needs the "Safety" of a SAFEED Patented

PREVENTS INJURY — SAVES GLOVE COSTS

Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED.

Write today
Early delivery.

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CHICAGO DIES

Complete Line of PUNCHING and FORMING DIES for All Sizes and Makes of PRESS BRAKES

4392

DREIS & KRUMP MANUFACTURING COMPANY
CHICAGO

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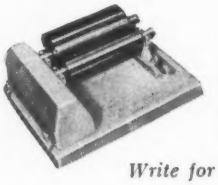
CIRCLE INFORM-A-GRAM KEY NO. 132D

Announcing

the NEW 24 inch SPITFIRE FLAT LAPPING MACHINE

LOW COST PRECISION LAPPING AT PRODUCTION SPEED

A NEW, large size Flat Lapping Machine of improved design for precision lapping of any material where a perfectly flat surface is necessary. Extremely close tolerance finishes are possible. An ideal machine for producing mating surfaces of sliding and rotating parts of air and liquid tight seals, plastic and die casting molds.



SPITFIRE
ROLLER LAPPING MACHINE

For lapping cylinders to accurate, mirror-like finishes in less time than any other method. Saves up to ⅔ time in lapping.

Write for Brochures, Prices and Delivery

SPITFIRE TOOL COMPANY
2935 N. Pulaski Rd. Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 132E

Uneeda LIGHT

directs a beam of white light on your close precision work.

Tool and Die Makers acclaim it for its utility, getting into nooks or crevices hard to get at with ordinary light—for lining up punches in dies, or working with the scriber in close places. Completely adjustable and portable. Light does not reflect back to your face. Ideal for Inspectors seeking burrs, flaws, etc. Price—complete with 2 size bulbs, $13.75.

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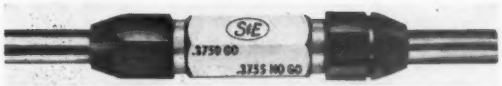
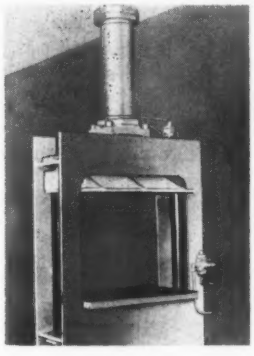
TWENTIETH CENTURY MANUFACTURING CO.
Box 429-TP Libertyville, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 132F

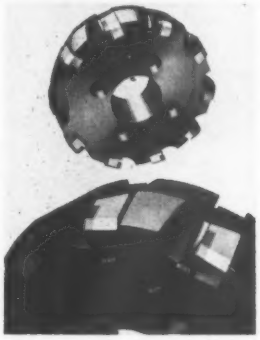


Carbide Plug Gages. A new line of tungsten carbide reversible plug gages are now available in a size range from 0.025 to 0.760 diameter. Further information on these new gages can be had from S & E Machine Products, Inc., Bridgeport, Conn. **Inform-A-Gram No. A22.**

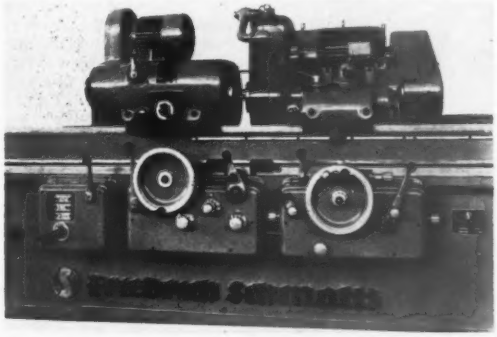


Compressed Press. Made by Sheridan-Gray, Inc., 405 Via Chico, Palos Verdes Estates, Calif., this press provides 24" x 36" platen with a 50-ton capacity and 30" stroke. These new presses can be operated singly or in multiple from a central pumping unit. The hydraulic power supply can be located in any convenient spot and need not be mounted on the press. Additional information available upon request. **Circle No. A23.**

Milling Cutters. Faster speeds and feeds are available with the new rugged and rigid milling cutters for ferrous and nonferrous applications now being offered by the Motch & Merryweather Machinery Co., Cutting Tool Div., Penton Bldg., Cleveland 13, Ohio. Heavy construction of these milling cutters prevent body distortion and generous chip grooves keep chips cleared from the work. Bodies are precision-machined, heat-treated alloy steel. Blades available are high speed steel and carbide tipped. Diameters are 3" through 24". Write to Motch & Merryweather for further information. **Circle No. A24.**

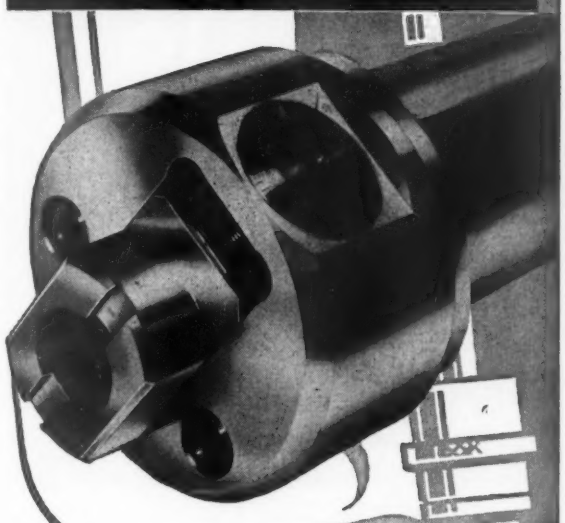


Hydraulic Cylindrical Grinders made by Schmaltz of Germany are built in 5 sizes ranging in swing from 16" to 32" and can be furnished with center distances from 40" to 160". They are of modern design and built to high accuracy standards. All feed dials are graduated in 0.0002" diameter reduction. The work table top is of



triangular cross-section for best absorption of grinding pressure and weight of work piece. It can be swiveled for grinding slender tapers, the amount of taper being set by graduated scale and vernier. The work carriage can be traversed either manually or hydraulically with infinitely variable table speeds up to 12' per minute. The American sole distributor is Parker Machine Co., Inc., 158 Pioneer St., Brooklyn 33, N. Y. **Circle No. A25.**

JOB PROVEN!
SAMSON
offset BORING CHUCKS



precision built by precision toolmakers for accuracy and durability in service!

• Designed for quick tool change; equipped with new, extra large dial for precision radial adjustment; machined to provide positive dead centering for rigid, high production milling and boring without removal of chuck; available with a complete selection of interchangeable accessories—these are features that make the Samson Offset Boring Chuck the logical first-choice of the field.

Write for complete information today

ALSO Distributors of famous LAST WORD WHEEL DRESSERS

LAST WORD sales company
18500 MT. ELLIOTT AVE. • DETROIT 34, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 133

OPTICAL COMPARATOR CHARTS

New 16 PAGE

Catalog-Price List covering hundreds of stock standard precision plastic charts for every make and model of projector and comparator.

SENT FREE UPON REQUEST
Catalog No. 53-70

GAGE COMPANY
BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 134A

There's a reason 76%*

of all popularly-priced Tool and Cutter Grinders sold in 1952 were *"Knock-Outs"*

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN S D

* SALES STATISTICS FURNISHED ON REQUEST

CIRCLE INFORM-A-GRAM KEY NO. 134C

RING PUNCHES

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HARD...
tough . . .
concentric . . .

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies
Ring Type or Press Fit Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

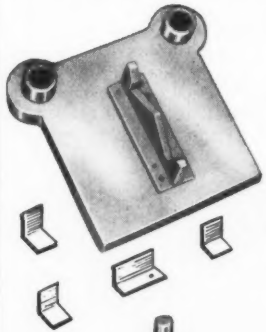
Exclusive Distributor Wanted for the States of Washington and Texas

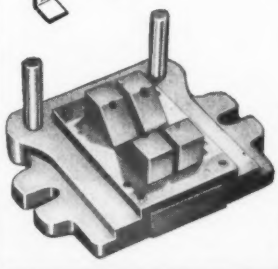
Ring Punch & Die Co.
108 FOOTE AVE., JAMESTOWN, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 134B

Punches and Dies

Angle Iron Cut Off Die





No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

— or what have you?

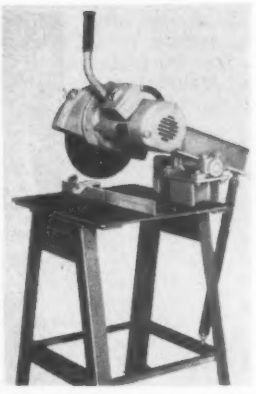
What are your punch and die needs? Consult us about those problems. *Satisfaction is your reward when you Re-WARD your orders.*

Send for free illustrated catalog No. 152 AA. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 134D

Cut-Off Machine. The new Stone Model M-35 cut-off machine is equipped with a full 3½ hp geared-in-head motor. This direct drive permits delivery of full power to the cutting edge with resulting faster cutting speeds and longer wheel life. The machine uses a 12" abrasive wheel for cutting ferrous metals and a 12" steel saw blade for cutting non-ferrous metals. For additional information write to the Stone Machinery Co., Inc., 626 Fayette St., Manlius, N. Y. **Circle No. A26.**

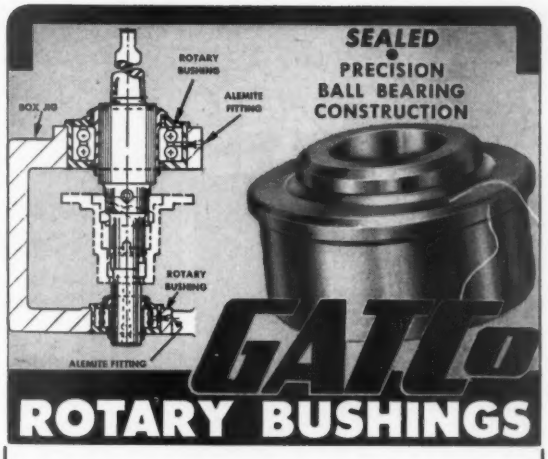


Automatic Press Brake Control. Accidents and spoiled work are prevented and production increased by the new AAC Automatic press brake control made by the American Actuator Corp., 40 Hudson St., New York 13, N. Y. With this control,

the ram of the press brake can be set to stop automatically at any point in the down stroke by knob adjustment of the pre-determined stop. A catalog page giving complete information on this control unit, including all possible operations, may be had by writing to the American Actuator Corp. **No. A27.**

Gear Shaving Machine. This unit was designed for shaving gear tooth profiles of large turbine pinions, where close tolerances and high quality finish are required. The machine is known as David Brown-Muir

S24H. It will shave pinions of 4" to 24" diameter and up to 100" long. Specific information may be had from Morey Machinery, Inc., 410 Broome St., New York 13, N. Y. **Circle Inform-A-Gram No. A28.**



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CORE DRILLING
ROUGH
AND
FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear —Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

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42330 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.

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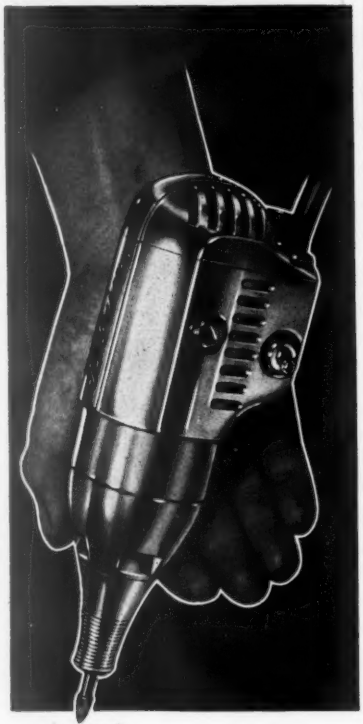
NEW 45,000 R.P.M. AND 1/5 H. P. IN 35 OZ.

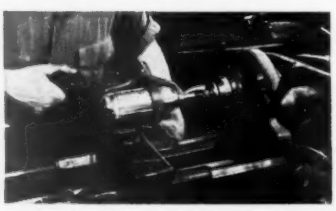


Precise

SUPER 30

OUTWORKS, OUTLASTS ANY TOOL IN ITS FIELD

Twice the power and speed in smaller size and less weight for more uses. Exclusive features include PRECISE Spindle and *draw collet chuck* for precision and quick, easy tool change. Operates *tungsten carbide* Midget Mills as efficiently as conventional rotary tools for grinding, milling, finishing, polishing and other applications on soft and hard materials including the hardest alloy steel. Micro-precision bearings have lubricant sealed in for life; AC/DC motor is air-cooled. Tool measures only 7⅜" long and tapers from 2⅛" at mounting diameter to only ½" D. at chuck nose. Unique PRECISE Mounts are available for set-ups on machine tools.

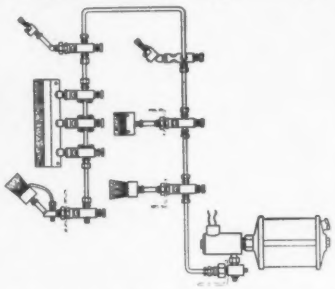


Write FOR CATALOG

PRECISE PRODUCTS CORPORATION
1341 CLARK ST. • RACINE, WIS.

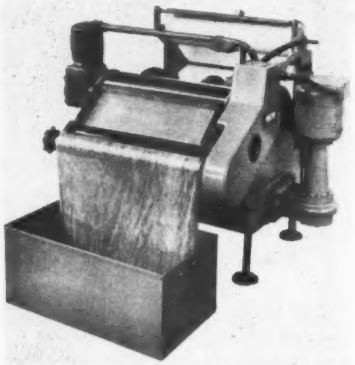
CIRCLE INFORM-A-GRAM KEY NO. 136A

Chain Oiling. Here is an idea of how a new chain oiling system, recently developed by the Oil-Rite Corp., 2332 Waldo Blvd., Manitowoc, Wis., operates. The single line sys-



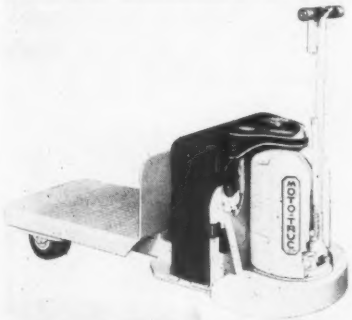
tem consists of a central oiler which feeds one or more valve brush assemblies connected in series by means of copper tubing.
Circle Inform-A-Gram No. A29.

Filters. A new large capacity model has been added to the Kleenall line of combination fabric and magnetic filters by the Barnes Drill



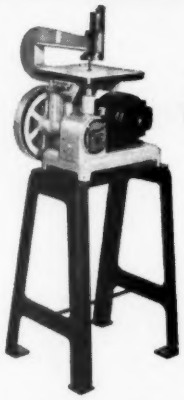
Co., Rockford, Ill. This unit has a flow capacity 4 times greater than the original unit recently introduced.
Circle Inform-A-Gram No. A30.

"Eye Appeal" Truck Design. Redesigning of the power unit of this truck offers easier maintenance. Other new features of this vehicle made by the Moto-Truc Co., 1990 E.



59th St., Cleveland 3, Ohio are a new time delay, slow speed switch which eliminates the possibility of starting off in high speed; and lowered electric battery cables and connector for better protection. Further information is available from Moto-Truc.
Circle Inform-A-Gram No. A31.

CUT TOOL AND DIE-MAKING COSTS WITH . . . *Milwaukee* DIE FILERS PROFILE GRINDERS



DIE FILERS

. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

Write for illustrated Bulletins and Prices

PROFILE GRINDERS

. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

RICE PUMP & MACHINE COMPANY
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BY A QUICK, EASY, INEXPENSIVE METHOD
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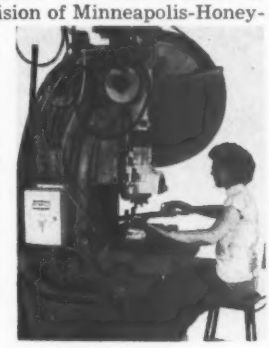
Large Stock on Hand, Many Sizes and Types
Send For Full Information and Free Samples
WECKESSER CO., 5261 Avondale, Chicago 30, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 136D

Monarch Live Centers. Accuracy of 0.0001 is guaranteed in new Monarch live centers equipped with precision matched No. 3 Timken bearings. Interchangeable points are available in a wide variety of sizes for standard male, long male, standard female and standard pipe points. Fully detailed bulletins are available on request for Monarch live centers and other tools in the Royal line for light medium, and heavy duty on lathes, grinding and milling machines. Write to Royal Products, 82 Union St., Mineola, Long Island, New York.

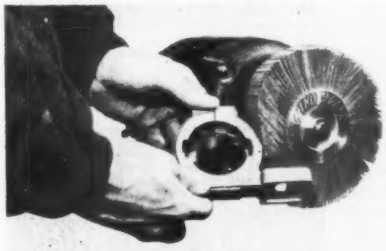
Inform-A-Gram No. A32.

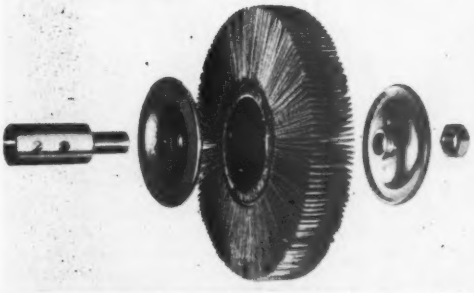
Safe In The Clutch. A new two-hand clutch control, called Micro-Trip, for manually operated power mechines is shown here on a punch press. The unit is made at Freeport, Ill., by MICRO, division of Minneapolis-Honeywell Regulator Co., which says its installation usually results in a 10 to 25 per cent gain in production. It may also be used with single switch control in applications where one hand is otherwise occupied. It has an instantaneous electrical response, and a light touch actuation that reduces operator fatigue besides providing greater safety. Write for further information.



Inform-A-Gram No. A33.

Flexible Grinding Wheel. This new tool, known as Grind-O-Flex, is a flexible grinding wheel which consists of hundreds of individual abrasive cloth leaves sealed to a hard core. As the wheel rotates it presents

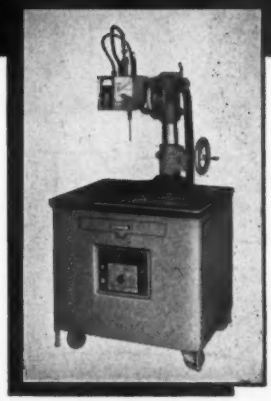




a continuous abrasive surface to metal parts. It is designed to smooth surfaces and remove flaws from contours without the danger of digging into the stock. Write to Merit Products, Inc., 4023 Irving Place, Culver City, Calif., for further information. **Circle No. A34.**

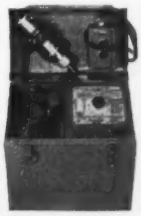
METAL DISINTEGRATION

and what it can do for you



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.)



There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

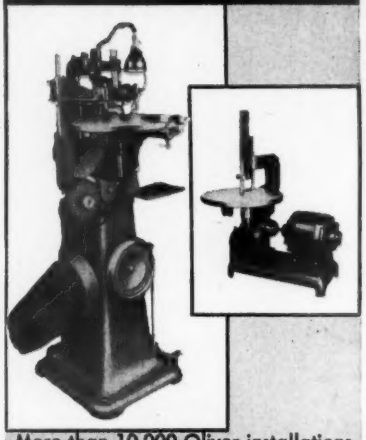
Metalmaster
DIVISION OF CLINTON MACHINE COMPANY
CLINTON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 137

Get Precision Perfection

Slash Costs with

OLIVER DIE MAKING MACHINES



More than 10,000 Oliver installations are saving up to 60% in time and labor on jobs where efficiency, accuracy and speed are demanded. Skilled labor is not required for sawing, filing and lapping the proved Oliver Way.

Oliver's 40 years of experience proves without a doubt that it is quicker and cheaper to saw out a piece than to drill and chip it. Oliver Die Makers do all sawing, filing and lapping operations with ease, economy, and speed. Many Oliver Die Making Machines have been in continuous use for more than 25 years. Let Oliver of Adrian save dollars for you in making less-expensive dies, gauges, templates and cams.

OLIVER OF ADRIAN

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
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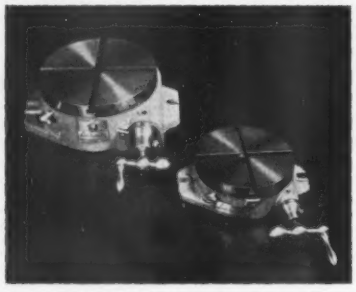
DIE MAKING MACHINES

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1436 E. MAUMEE · ADRIAN, MICHIGAN

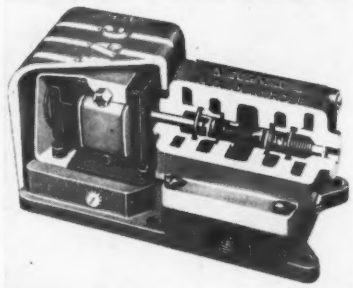
CIRCLE INFORM-A-GRAM KEY NO. 138A

Rotary Table. A new 8" rotary table has been added to the 6" line produced by the Benchmaster Mfg.



Co., 1835 W. Rosecrans Ave., Gardena, Calif. The 6" and 8" models are pictured, showing size comparison. **Circle Inform-A-Gram No. A35.**

Air Valves. The basic design of the new improved solenoid operated air valve pictured embodies an aluminum alloy, surface hardened spool, on which the sealing material is integrally molded and bonded. These seals enter the precision finished, bearingized and highly polished bores of body and retainers to effect instantaneously a positive "Sealed with air pressure" seal. Write to Mechanical Air Controls, Inc., 15311 W. 11 Mile Rd., Detroit 37, Mich., for complete catalog. **Circle Inform-A-Gram No. A36.**



Replaceable Vise Jaws. Included as standard on all Wilton machinists' vises, jewelers and combination bench and pipe vises are hardened jaws with diamond serrations. These may be replaced with smooth jaws of hard or soft steel or of non-magnetic and non-sparking brass or copper. For delicate soft work, there also is Wilton's line of plastic fibre jaws. A 28-page catalog illustrating the vises and other industrial clamping tools is available from the Wilton Tool Mfg. Co., 925-941 Wrightwood Ave., Chicago 14, Ill. **Circle No. A37.**

***Beauty* TO LOOK AT**

...BEAUTY IN *Performance*

Hollow-ground and bright all over, Reltool End Mills are not only the best looking end mills you ever saw . . . they're proven in performance and cutting efficiency. In addition, they're designed for *easy chip flow* and 10% to 35% longer cutting life. Next time you need End Mills, re-tool with Reltool!

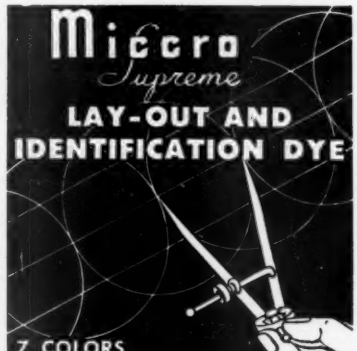
The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

Write for Reltool's net price catalog 53.

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 138B

Miccro *Supreme*
LAY-OUT AND IDENTIFICATION DYE



For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

MICHIGAN CHROME & CHEMICAL COMPANY
8615 Grinnell Ave. . Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 138C

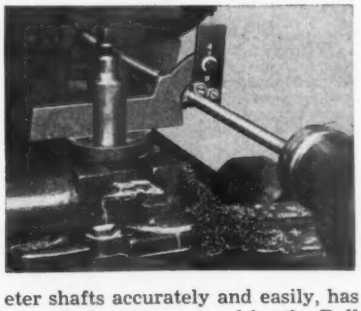
Steel Letter Set. Steel number and letter sets in popular sizes are now packaged in durable plastic boxes for simplified selection and easy storage. These steel number and letter sets are created for count-

less industrial marking applications. Seventeen sizes from 1/32" to 1" are produced with plain gothic style characters. Further information may be obtained by writing the Parker Stamp Works, Inc., 650 Franklin Ave., Hartford, Conn. **Circle Inform-A-Gram No. A38.**

Layout Fluid. The Dayton Rogers Co., Minneapolis 7, Minn., has for distribution, in a new container and mailing case, free representative samples of its layout fluid. This fluid saves polishing and drying

time and makes an easy-to-see layout that relieves eye-strain. The bottle container is provided with a combination brush-in-cap for applying the material to the surfaces of all metals previous to layout and machining. For your sample and further information write to Dayton Rogers now.

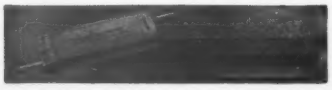
A new type of tool holder and follow-rest combination, designed especially for turning long, small-diam-



eter shafts accurately and easily, has recently been announced by the Pull Gear Co., 4118 E. 8 Mile Rd., Detroit 34, Mich. **Inform-A-Gram No. A39.**

THE KOCH TEST INDICATOR

IS THE ONLY TOOL MAKERS INDICATOR ON THE MARKET WITH TWO WORKING ENDS, FOR PRECISION WORK, ONE END TO TEST OUTSIDE SURFACES, THE OTHER INSIDE.



WHAT EVERY TOOL ROOM TOOL MAKER OR MACHINIST NEEDS.

Plunger moves away from, instead of against the lever, protecting delicate parts from sudden or excessive jolts. Each graduation on scale represents 1/1000" movement of plunger. $7.50 plus postage.

Positive-Lock SURFACE GAGE

Drawbolt has positive lock to prevent slippage. Spindle: 9"x5/16". Block: 3¼"x2½"x1" with 90° angle groove in base. Surface Gage is precision ground. $8.75 plus postage.

Ask your dealer for these tools and buy through him. If he cannot furnish them, Write to us.

ANDREW GENALES, NYACK, N.Y.
A-28 Second Ave. Tel. Nyack 7-2222

CIRCLE INFORM-A-GRAM KEY NO. 139A

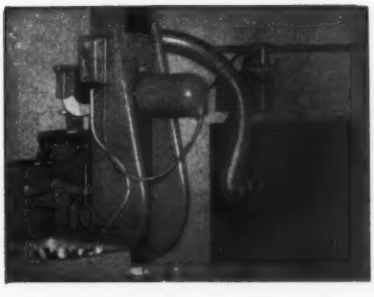
STOP DUSTS INSTANTLY
with
DUSTKOP

Available from stock of 22 standard models.

300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.

AGET-DETROIT CO.
213 Main St., Ann Arbor, Michigan



CIRCLE INFORM-A-GRAM KEY NO. 139B

JIG BORING
Done to your specifications
We Have
12 Jig Borers
Including the largest
Pratt & Whitney made

BLOOMFIELD TOOL CORPORATION
30 Farrand St. Bloomfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 139C

OK
T-slot Bolts

The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Typical direct prices for 10" lengths: ½ — $1.36; ⅝ — $1.36; ⅞ — $1.58; ⅞ — $1.89. Write for price list

THE O K TOOL COMPANY, INC., Milford 8, N. H.

CIRCLE INFORM-A-GRAM KEY NO. 139D

Specify DESTACO Arbor Spacers and Shims

For milling, slitting and gang-saw setups, shimming gears and bearings. Sets in 20 diameters ⅜" to 4" . . . 19 graduated thicknesses .001" to .125", specials over .125". Spacers with keyways, shims without. Stocked by Industrial Distributors.

DESTACO DETROIT STAMPING COMPANY
344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 139E

PRECISION-FINISH YOUR OUTSIDE DIAMETERS

The Odee-HONE

★ ACCURATE
★ INEXPENSIVE
★ VERSATILE
★ LIGHTWEIGHT

Corrects out-of-roundness, waviness, chatter . . . Generates diametric size within .0001" tolerance . . . Hones all parts from ½" to 2½" in diameter—regardless of length or material . . .

Can be used on any lathe, drill press, electric drill . . .

Simple to set up and operate—no aligning, fixturing or wheel dressing is necessary . . .

Removes a few "tenths" or a few "thousandths" stock in less time than it takes to re-center, indicate a part, and dress an abrasive wheel.

Write to:

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 38, MICHIGAN

Guilford, Conn. • Rockford, Ill. • Los Angeles 23, Cal. • Brantford, Ont., Canada

CIRCLE INFORM-A-GRAM KEY NO. 140A

SAVE TIME AND MATERIALS

Oil-hardened tool steel tapered pin gages accurate to + 0.0001" − 0.0000" insure dependable sizing and location of holes and slots for machinists, set-up men, tool and die men, inspectors, all who need precise hole measurement.

CONCENTRIC TAPER on lower half of each gage fits holes 0.0012" smaller than standard letter, fraction, and number size drill holes. Makes insertion easier. Permits gaging of odd-size holes and slots.

ALL GAGES are 1½ inches long. Sets contain a pair of each size in a plastic case with 4-place decimal equivalents of each size plainly marked.

ALL ITEMS STOCKED FOR IMMEDIATE DELIVERY

THE Horberg GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

Quantity

..... Letter set. @ $ 50. 52 gages (A-Z)

..... Fraction Sets @ $ 36. 60 gages (3/64" to ½" in 1/64" steps)

..... Number Sets @ $10.4. 120 gages (1 to 60)

..... Single gages @ $ 1.

..... Stand alone @ $ 10.

Please Rush checked items and literature to

company .....

address .....

name .....

title .....

CIRCLE INFORM-A-GRAM KEY NO. 140C

Our more complete stocks mean "at once" shipments of quality fasteners when you need them—no production delays—no maintenance "shut downs."

"Chicago" quality threaded products include:

Hexagon Head Cap Screws, Bright and Heat Treated Grade 5 • Square Head and Headless Set Screws • Hexagon Nuts • Hexagon Castellated Nuts • Socket Head Cap Screws • Socket Set Screws • Socket Pipe Plugs.

To Speed deliveries to you, order "Chicago" products from your nearest Industrial Supply Distributor. He carries a complete stock of our products—he will gladly furnish you with samples—his familiarity with your local field conditions enables him to fill your needs promptly and correctly.

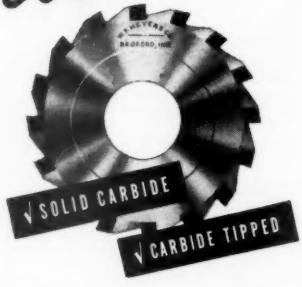
The CHICAGO SCREW COMPANY

2519 WASHINGTON BOULEVARD

BELLWOOD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 140B

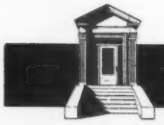
PRECISION CIRCULAR CUTTERS



MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.



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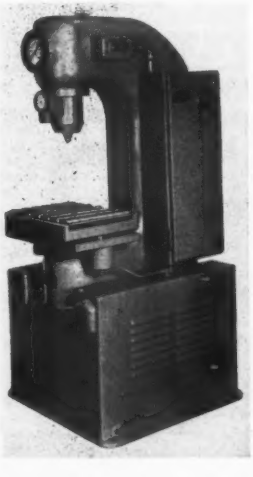
CIRCLE INFORM-A-GRAM KEY NO. 140D

Metal Cleaning Equipment. A large "cold" parts cleaning unit for flushing, spraying or soaking metal parts, dies, large bearings and assemblies has been added to the line of metal cleaning equipment made by the Graymills Corp., 3705 N. Lincoln Ave., Chicago 13, Ill. The cleaning solvent flowing into the unit can either be delivered through an abrasive proof pump or can be directed by an operator. Minimum solvent capacity is 100 gal.; maximum is 175 gallons.

Inform-A-Gram No. A40.

Heavy Presses. The Cleveland Crane & Engineering Co., Wickliffe, Ohio, announces its entry into the heavy press field with the introduction of a completely new line of presses ranging from 160 tons capacity and up for forming, blanking, piercing, trimming, light embossing

and drawing. The new presses will contain such new features as straight-sided frames, modern barrel-type slide adjustment and an especially developed clutch and brake. The manufacturer will welcome inquiries for additional information. **Circle Inform-A-Gram No. A41.**



Hardness Tester. A Production model Brinnell Hardness testing machine, designed to fit directly into a conveyor system, is announced by Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 21, Mich. Highlight of the new design is a roller conveyor arranged in conjunction with the anvil of the tester. The "anvil" consists of a series of hardened steel bars firmly affixed to the lower portion of the machine. The conveyor rollers are interspersed between the bars and raised and lowered automatically. Write for further information **Circle No. A42.**

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Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

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It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

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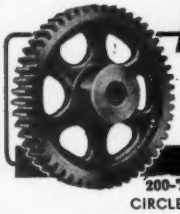
• Experienced in LUBRICATION Engineering
• Originators of Really High Speed AIR TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 141

Sub-Contract Speeds Gisholt Rebuilding for Detroit Transmission

Over 50 Gisholt No. 12 Hydraulic Automatic Lathes were involved in the Detroit Transmission fire last August. The machine shown at left was typical of those which had to be completely disassembled, cleaned and inspected. Rebuilding had to be fast, accurate, and meet new machine performance standards.

At the right is the very same machine just three weeks to the day after the other photo was taken. Rebuilding was done by the Continental Gin Company, of Birmingham, Alabama. Shown with the machine are (left to right): Carl Lewis, Master Mechanic of Cadillac; George M. Class, Vice President in Charge of Engineering of Gisholt; and Merrill Pratt, President of Continental Gin.



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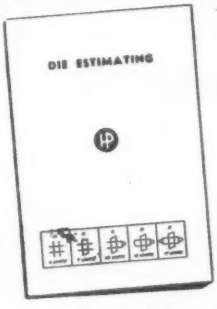

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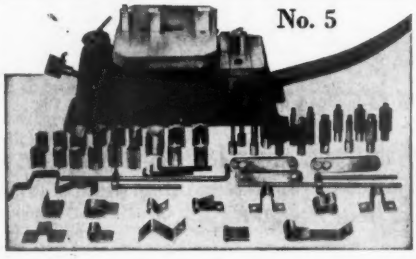

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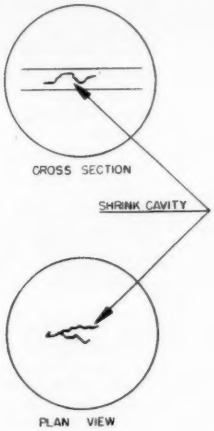
CIRCLE INFORM-A-GRAM KEY NO. 144C

. . . Ultrasonics, from page 114

trasound in the metal, the sonic beam diameter vs. the size of the flaw, nor the energy lost by the ultrasound in refraction in the metal. B-scan presentation requires the operator to judge flaws by their shape and position in the metal rather than by the strength of their echoes.

A third method of presenting ultrasonic flaw data is known as the plan view ("C" scan). A plan



view image shows only the outline of the flaw or the distribution of several flaws that lie within the area being inspected. As in the case of an X-ray picture, it is difficult to inform the inspector just where the picture has been taken. One can lay upon the surface of the metal being inspected small blocks that will show as position markers on the TV screen, or the recording. There is the problem of defining just what echo indications are to show on the record. The sorting circuits discard the echo caused by the transmitted pulse, the front surface echo, the rear surface echo, and water multiples, keeping only any echo that lies between the front and rear surfaces of the metal being inspected.

Such a sorting of echoes requires high electrical intelligence, or else some preset knowledge of the thickness of the metal being inspected. A counting circuit can be provided to recognize the first echo to arrive after the ultrasound is transmitted. However, the next echo to arrive may be either a flaw or the rear surface. To know the difference, one must either dial into the circuit the thick-

. . . Continued on page 153

ENCO TINY TITAN TRADE MARK NO. 100 New Superior Magnetic Base Holder

FOR MOUNTING TEST INDICATORS INSTANTLY TO FLAT OR DOWN TO ¾" ROUND WITH PULL OF 65 LBS.

Model 100 being used to align fixture in production mill.

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NEW! 3-step universal rod for all indicators. Sizes 5/16", ¼" and 3/16" diameters.

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NEW! Fool proof adaptor allowing 360° adjustment in all directions.

NEW! Magnetic pull 65 lbs.

PRICE $8.00 COMPLETE Attractively boxed.

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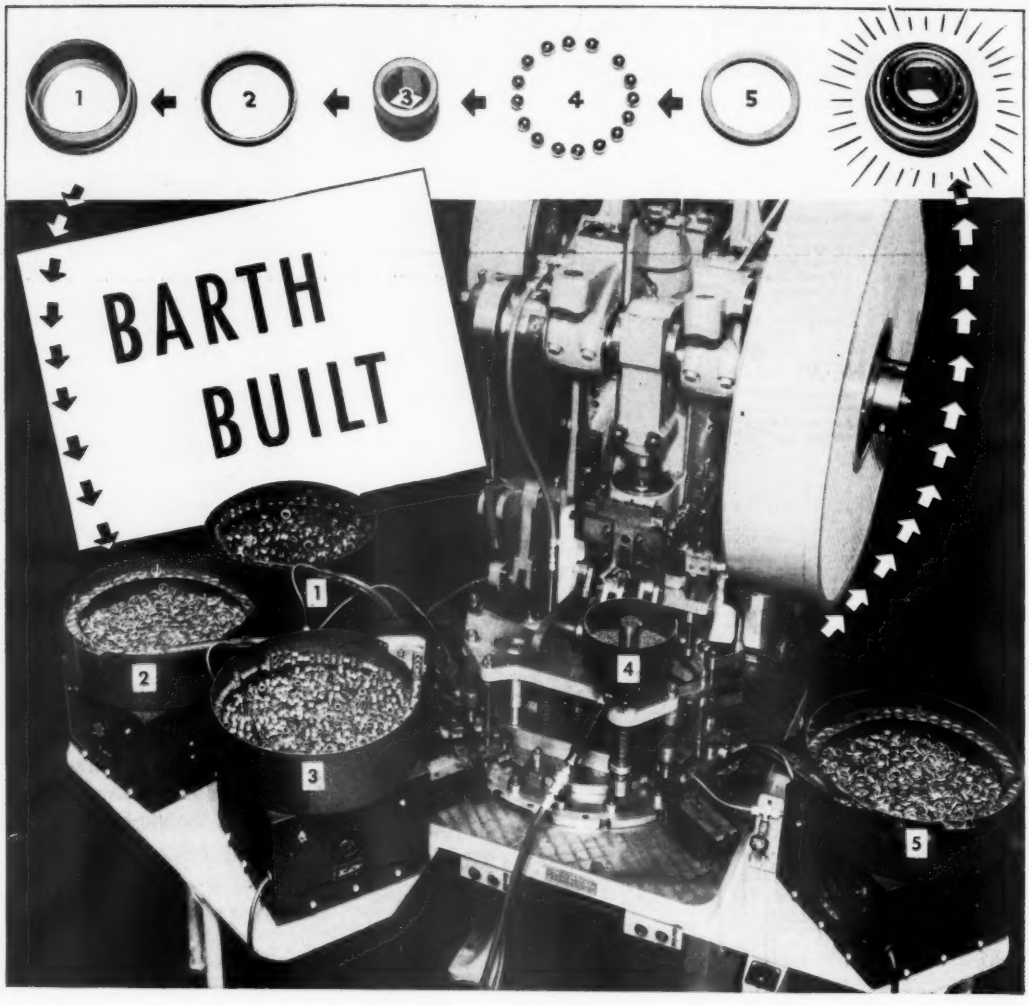

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CIRCLE INFORM-A-GRAM KEY NO. 146

. . . Operations Expedited, from page 45

drill presses are retracted by air cylinders timed to act in sequence with the feed slide. As each new piece is fed in from the bottom of the stack, the one ahead that has just been chamfered is pushed out into a slide and passes thence through a set of straightening rolls (Fig. 5). These remove any camber that may be present despite roll straightening before blanking.

In the setup shown, Zagar multiple drill heads are used because, in some cases, the holes are too close to use conventional geared heads. Almost any tooling suiting the piece to be handled can be applied. In some cases, certain tools used in one setup may not be needed in another and are left out. It is possible to handle either right or left parts, when this is required, merely by altering the tools or their position and adjusting the magazine or using another, as long as tool interferences are avoided. Tools usually make cuts on both sides of the blank at the same time.

With a setup of this kind, which can be changed quickly to handle different parts, an average of 300 pieces an hour can be processed and the setup operates automatically, save for the loading of parts in the magazine. If parts require restacking to facilitate subsequent processing, they are made to collect in a chute and are transferred as needed to tote boxes.

By stacking and magazine feeding of some parts formerly fed individually by hand, daily output for certain operations has been increased from about 3,000 to about 20,000 per eight-hour day. Such an increase fully warrants such extra equipment as is needed for stacking and magazine feed, especially as these extras involve only quite simple and inexpensive units.

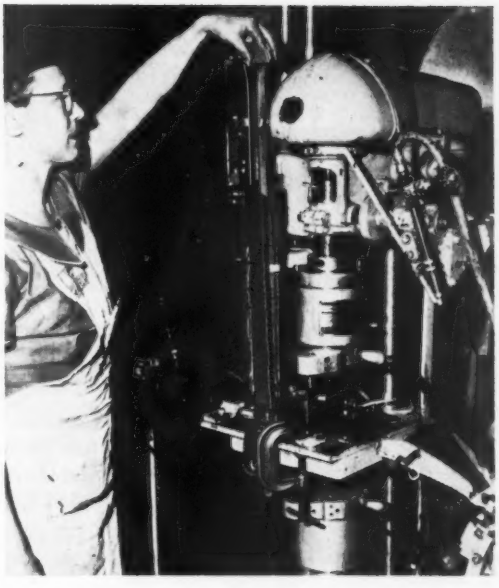

Fig. 4. Special double-end drill press setup using two Zagar heads carrying tools that chamfer holes automatically from both sides of blanks. These are fed from a magazine by a slide reciprocated by the piston of an air cylinder at left.

. . . Continued on page 148

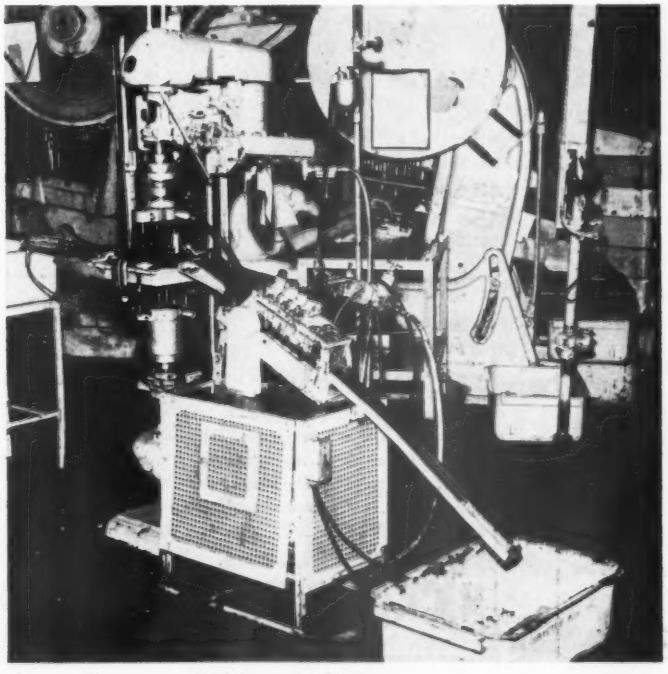

Fig. 5. Setup that includes the drill press shown in Fig. 4 and a set of straightening rolls that receive parts after ejection from the press. All operations are automatic except for loading the magazine, and parts stack in the chute at right for transfer to the next operation.

PRODUCTION UP
COSTS DOWN
WITH Commander
PRODUCTION TOOLS

Adjustable MULTI-DRILL
● Adjustable To Any Hole Pattern
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● Fits Any Drill Press

Increase production up to 800%—save time, cut costs. Mounted without alterations or special tools. 9" drilling area; centers to ½". Extension Spindles available to increase area to 22½". Special adaptations available.

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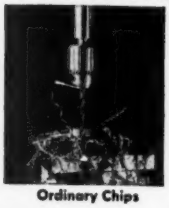
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CIRCLE INFORM-A-GRAM KEY NO. 148A

. . . Operations Expedited, from page 147

Among parts formed after blanking are type bars for 42 keys divided into 21 rights and 21 lefts, each formed with a slightly different offset to fit properly into the typewriter assembly. All 42 are checked on the fixture shown in Figure 6. Directly in front of the inspector is a block that is movable along a slot and is precisely located by dowels that fit into holes for each checking location.

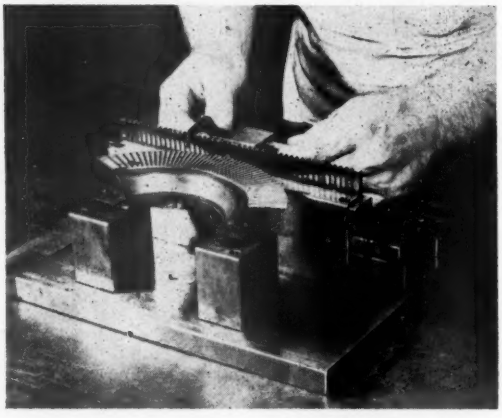

Fig. 6. Fixture or gage in which 42 different type bars are checked to make sure that each has the specified offset. Each bar when fitted over a pivot pin in a block between the operator's hands must drop freely into slots on the comb and sector.

In checking, the type bar is set over a pivot pin on the movable block and through a close fitting slot in the comb-like portion of the fixture. When in this slot, the flat portion of the stamping has no play. Then the offset end must drop freely into the corresponding close fitting slots in the sector portion of the fixture. Any part failing to fit the gage is rejected. This gaging necessitates close adjustment of forming dies but is necessary to insure the required close fits at assembly. This fixture is indicative of the care required in production operations in this plant.

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CIRCLE INFORM-A-GRAM KEY NO. 148B

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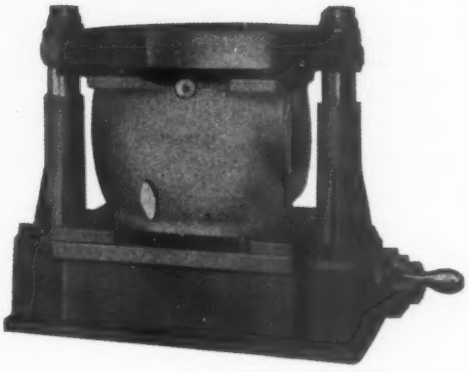

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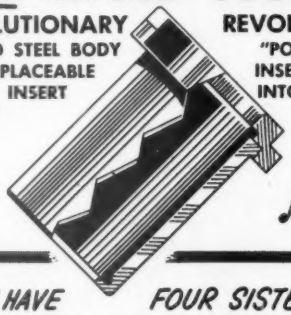
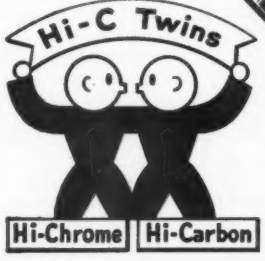
REPLACEABLE
INSERT



REVOLUTIONARY
"POP FIT" COIL
INSERT DIRECTLY
INTO JIG PLATE



THE TWINS NOW HAVE *FOUR SISTERS . . .*

SOLID AREAS INDICATE LOCATION OF NYLON

REVERE BEARINGS FOR MACHINERY AND AUTOMOTIVE USE

Revere Fisher **ENGINEERING COMPANY** NORTH BRANCH MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 149B

PRESCRIPTIONS FOR PRODUCTION

Automatic welding of large, heavy work is facilitated by use of Worthington's Model 60 precision positioner. Table, operated by variable speed drive, indexes or rotates continuously as needed. Machined table surface is fitted with T-slots, scribed centering grooves and pilot centering bore. For greater convenience in loading and for efficient welding angles, table tilt motors are available; table tilts through 135° in 40 seconds.

An accurate, level sturdy surface for assembly operations is quickly built up from new-type Challenge floor plates that feature hardened leveling screws adjustable through upper plate surface. Plates require no superstructure for accurate leveling over any firm foundation. Sectional units up to 144" x 54" interlock to make up any desired floor area.

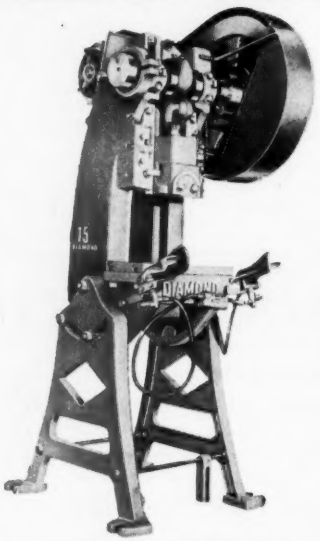
PRECISION PRESS FRAME ALIGNMENT

Thru Seasoned Castings!

What Does This Mean to You?

CONTINUOUS Production

- ✓ NO WARPAGE OF FRAME
- ✓ PERFECT PUNCH & DIE ALIGNMENT
- ✓ LONGER DIE LIFE
- ✓ EXTRA PRESS FRAME STRENGTH



Diamond 15-ton open belt press illustrated with optional air controls. Sizes range from 9 to 60 tons. Open belt and back geared.

SEASONED CASTINGS—Above photo illustrates a partial view of Diamond press frames outdoors under exposure to all weather conditions. They are left to season by this natural process for an average period of three years. This assures castings of the highest quality.

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PICO, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 150

Warner & Swasey production tested the new steel-cutting grade 370 Carboloy cemented carbide, and found that they could machine chromium-molybdenum steel, SAE 4150, at higher speeds and greatly increased efficiency. Rough, hand-forged chuck scrolls, 20" dia., were machined with standard single point tools at 300 sfpm and 0.0125 feed, with half-inch depth of cut! This performance was obtained on a high production job, while gaining a marked increase in tool life. Grade 370 has a high edge strength, higher red hardness and better combination of toughness and wear resistance than previous general purpose steel-cutting grades.

Yet to be announced is the new portable combination etcher demagnetizer, and soldering unit developed by Electro-Arc Manufacturing Co. It's a small, compact, low-cost unit that looks like it would be an exceptionally handy item, and particularly for any small machine or tool shop.

Precision cutting by oxy-acetylene torch can be economically accomplished by use of the Ultragraph, a unique torch guiding machine. A strong Alnico permanent magnetic field provides continuous, positive attraction of the tracing rotor to the edge of the steel pattern. Travel speed can be rheostat regulated, giving a uniform cutting speed suitable for the material thickness—from 14 ga. to 8". Tolerances of plus or minus 1/64" are held.

Relatively long narrow sheet metal workpieces having difficult bends plus cross-sectional detail can be formed with very close control on the new Cyril Bath precision stretch former. Machine features a right angle power arm that "irons" material against the die as turntable revolves.

Extremely fast production on small light operations such as assembling, staking, bending, marking, is possible on an air impact press like the Cadillac No. 52. This bench-model press will operate as fast as 10M strokes per hour. Good tooling is required to get the most out of such a unit. We saw one press outfitted for high speed marking of small thin metal discs. A Bellows air-operated dial type indexing table was in use, with shallow nests (depth equal to workpiece thickness) cut into the top surface. Discs to be stamped are loaded into a vertical cylinder, the bottom one resting in one of the nests. Indexing of the table carries the bottom workpiece from the stack onto the next station. After stamping, the workpiece is air ejected through a chute into a tote box.

PRESCRIPTIONS FOR PRODUCTION

Want to speed up polishing, buffing and other finishing operations? Take a fast indexing table with 5 to 40 rotating work spindles, encircle the table with standard pedestal-mounted wheel type or abrasive-belt heads, provide automatic head lifters and automatic work chucking, synchronize and time all movements . . . and you have the basis for substantial savings in finishing costs. Hammond's Super Automatic is a complete packaged setup utilizing standard units put together to do a specific job.

Phenomenal gains in tool life and increased cutting speeds are being racked up for Latrobe Steel's new high-speed-steel containing molybdenum disulphide. Inclusion of this metallic film lubricant greatly lowers the amount of heat generated by chip friction and rubbing action below the cutting edge. It is possible that it also tends to limit heat adsorption into the cutting tool.

Unusual versatility for large heavy tool and die work, ease in machining cast-iron and alloy steel, and ability to hold close tolerances are found in the Bokoe F3 universal boring and milling machine. The 26 x 24 table moves 28" transversely, 55" longitudinally, rotates or indexes through 360°. All movements powered and infinitely variable. Flexible covers protect guideways. Milling head features six rates of downfeed, infinitely variable spindle speeds, and angular positioning.

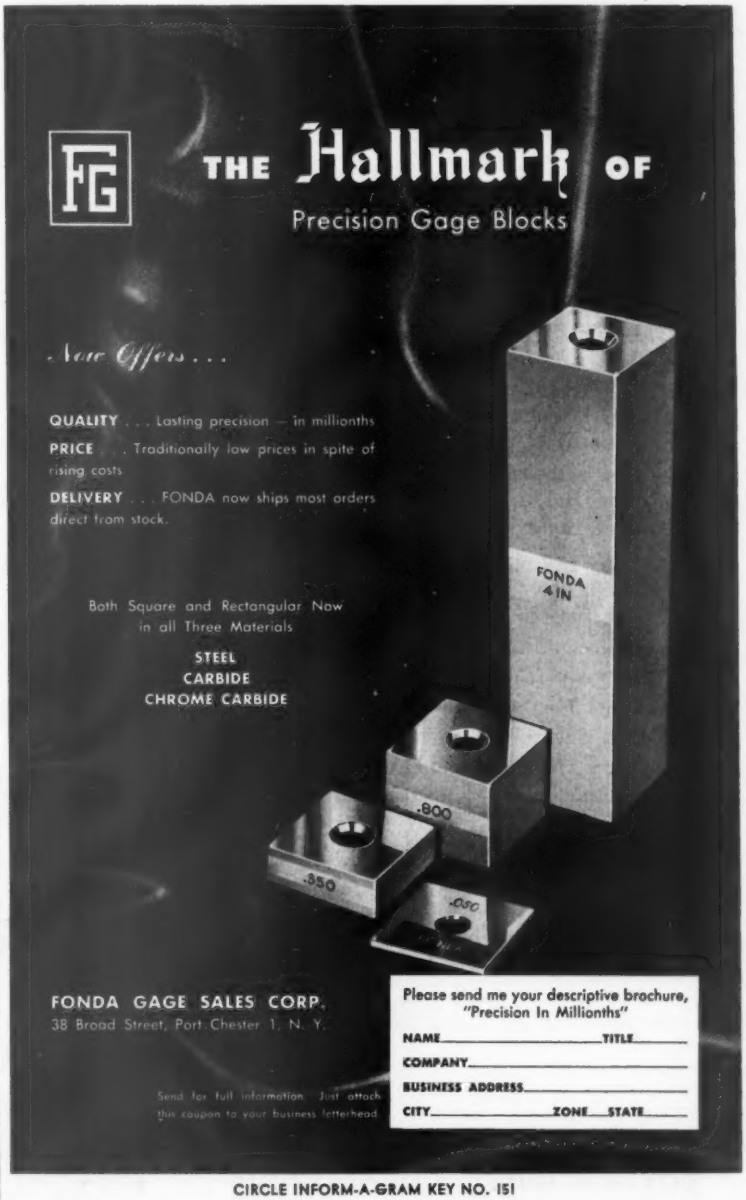
Faster multiple clamping of sheet metal parts for assembly operations is readily attained by use of new Lapeer air-operated toggle clamps. They permit development of a completely automatic clamping setup. Clamping speed may be controlled so as to eliminate hammerlike action.

Automatic sequence control of numerous pneumatic devices can be achieved with the Mead electropneumatic timer. Motor-driven camshaft carries a series of permanent cams, each infinitely adjustable. Twelve ports available, operable in any desired sequence. Sensitive remote-control buttons permit mounting of main valves convenient to working cylinders. Continuous operation or single-cycle, with any desired cycle-time set up within seconds by means of quick-change gears.

Small-work welding is often facilitated by the use of an Aronson bench turntable welding positioner. Foot operated electric clutch provides instantaneous control of motor-driven turntable. Hollow table spindle permits passage of shielding gases through work.

Another step forward in reducing machine tool down-time is elimination of repeated tool setting. This is achieved by using mechanically-held carbide tools of the Kendex type, having expendable inserts that can be indexed through their various cutting edges, then thrown away when worn, and replaced with new low cost inserts.

Rare metals are finding ever-widening fields of application. Westinghouse at Belleville, N. J., has one rhodium-platinum alloy feeder die that has produced in excess of 50 million electric light bulb bases. Ceramic dies previously had to be replaced, necessitating furnace shutdown, every million bases. The new die is in continuous operation, successfully combating intense heat, corrosion, and erosion forces.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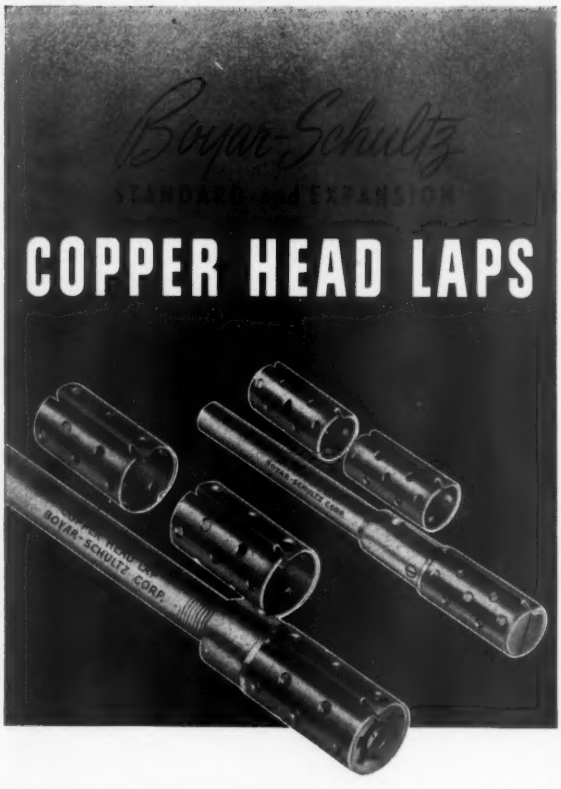

BOYAR-SCHULTZ COPPER HEAD LAPS are accurate, fast working and easy to use. They are much less costly than making laps in your own tool room. Because the only wearing part is the inexpensive copper sleeve, they are long lasting.

Unlike laps made for specific jobs, they are used over and over again, changing only the sleeves. Adjustment permits correct lapping size to be maintained till sleeve is worn out and replaced with a new one. Thus, with Boyar-Schultz Copper Head Laps you save tool room time and get accurate speedy lapping.

Copper Head Laps and Sleeves are immediately available from stock, in standard sizes—1/8" to 2½" diameters.

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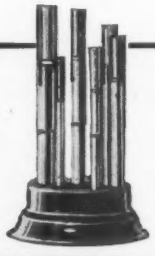
A time saving set in Tool & Die work. Set consists of seven most commonly used sizes - 1/8" - 3/16" - 1/4" - 5/16" - 3/8" - 7/16" - 1/2", with enameled die cast base.

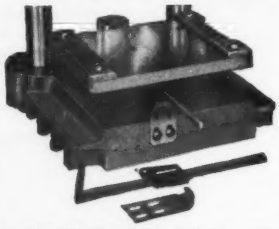


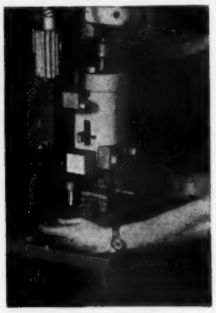
BOYAR-SCHULTZ CORPORATION
2116 Walnut Street Chicago 12, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 152A

Adjustable Automatic Stock FEED STOP for DIES

Dahlstrom Light Duty AUTOSTOP





No drill jig... No slotting... No milling...

$1.75

Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent weight.

TO INSTALL: Just drill one 7/32-inch hole, then drill and tap four mounting holes per directions. That's all there is to it!

Trial order $1.75 each; lots of 12 $1.50 each. State whether for use on compound or progressive dies. *Write for free pamphlet.*

***By the makers of the* DAHLSTROM TAP GUIDE**

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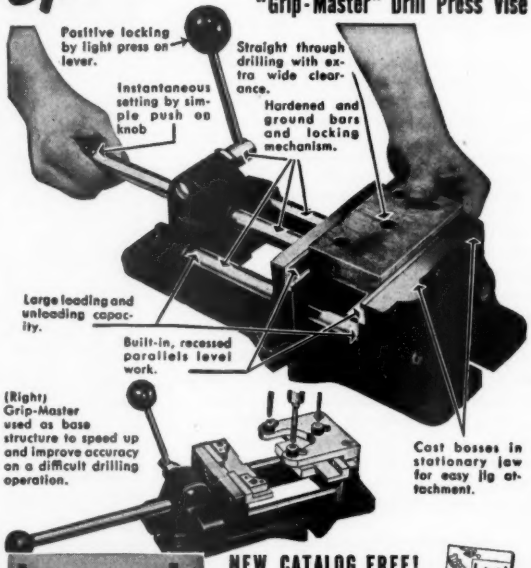
Speed-up OPERATIONS with heinrich "Grip-Master" Drill Press Vise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Cast bosses in stationary jaw for easy jig attachment.

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CIRCLE INFORM-A-GRAM KEY NO. 152C

. . . Ultrasonics, from page 144

ness (if known), or must have an automatic metal thickness gage built into the machine. This latter device works well only if the rear surface is rather constant. If the rear surface has considerable contour, the rear surface echo cannot always be received, making an automatic thickness circuit fail. The most practical solution is simply to arrange that the circuit define as a flaw any echo that occurs between the front surface and some preset depth.

Combining Presentation Methods

Of the three presentations mentioned, each shows only two of the three needed dimensions. A complete story requires some combination of any two of the presentations. It has been the practice to combine the B-scan system with a conventional A-trace flaw detector. As an alternative, one could combine into one machine two TV screens —to show the B-scan on one screen and the plan view on the other screen.

Attempts have been made to draw several separate cross-section or plan views, as seen from different points of view. One automatic flaw detector (custom-built) is capable of drawing a plan view as seen looking down from on top of a turbine forging, and two separate cross-section views, each rotated 90° to each other. The idea appears to have been practical, although the amount of complex electronic equipment involved is formidable.

If it is not practical to immerse the object being inspected so that it can be scanned by a machine-driven scanner, some means must be provided for directing the ultrasound through a water stream onto the surface of the metal. Also, the location of the ultrasonic head must be fed to the presentation unit. It is necessary that the position of the hand-held sonic head be described in X, Y, and A coordinates so that the presentation unit can draw a picture that duplicates the object being inspected. In a typical machine, the water-coupled ultrasonic head is scanned over the surface of a cast steel object. The arms, attached to the head, feed angle resolvers back in the computer section to produce electrical signals which duplicate the

. . . Continued on page 155

Enco
TURRET TOOL POSTS
SAVE VALUABLE SETUP TIME

The three photos at right illustrate the flexibility of 12-position indexing, whereby each tool may be used in three different working positions.

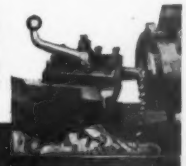
¾" square tool bit mounted in Model 4½-S turret used for facing cut.

√Accurate within .0005.
√12 position indexing.
√Hardened steel construction.
√Mounts rigidly in compound T-slot.
√Keeps setting accurately.
√Indexing is self-contained—eliminates all chip-interference.

The same tool used for broadface turning merely by indexing turret one position or 30°.

Manufacturers of the most complete line of HEXTURRET BED TURRETS, TURRET TOOL POSTS and TAIL-STOCK TURRETS in the country. Send for Catalog No. 53.

Same tool used for inside chamfer merely by indexing back two positions or 60°.



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Prolong die life as they clean and lubricate stock in one operation. Variety of models are available. Eliminates hand oiling yet inexpensive.

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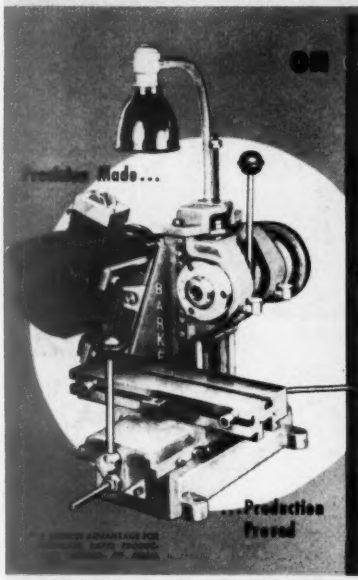

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Gorham "M-40-U" Alloy Centers are available with Morse, B. & S. or Jarno taper shanks. Immediate delivery on popular sizes, "specials" to specification. Free literature gives description, dimensions, prices. Send for your copy today.

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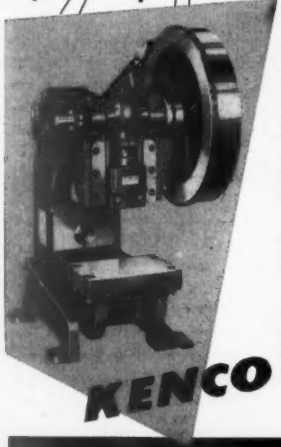

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And the Kenco 4-in-1 easily converts into a standard die space press, long die space, half and horn press... Four presses in one.

Let us prove you'll punch out big profits with Kencos . . . There are over 250 Kenco dealers to serve you. Write for details and name of nearest supplier.

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SILVER BRAZED with
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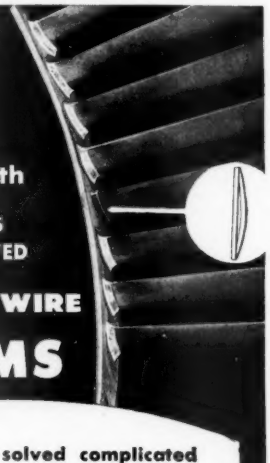

Large Manufacturer solved complicated *series brazing* problem.

L.M. stress relieved flat wire Preforms solved the problem of keeping alloy in contact with both the blade and base assembly thus insuring complete deposit of alloy at joint proper. No time was lost in placing silver solder in position for brazing operations. In addition there was *no waste* since precious alloy is metered to flow evenly in and around joints.

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CIRCLE INFORM-A-GRAM KEY NO. 154D

. . . Ultrasonics, from page 153

coordinates of the sonic head position.

As the operator scans the surface of the metal with the head, one cathode ray tube beam is following this motion and is prepared to brighten momentarily as the operator passes over a flaw. The other cathode ray tube will draw the cross-section view as it is developed. Thus, the operator can tell the area of the flaw by watching the plan view TV screen, and the depth and the angle at which the flaw lies from the B-scan screen.

If a machine-driven scanner of the immersion type is involved (where the test piece is submerged), the most useful presentation is the B-scan type, since the data is collected and drawn on the TV screen at a high rate of speed. The plan view data can be collected only relatively slowly, since it involves having the entire surface scanned before the total picture is completed. As an alternative, one can scan some small part of the surface area, but this leads to difficulty where there is considerable contour to the object being inspected.

One method for rapidly scanning the entire surface of the metal is to have the metal rotate under the crystal, and have the crystal feed in or out as in a phonograph turntable. It is applicable where the objects being inspected have symmetry of rotation.

An alternate method is to use a high speed reciprocating holder for the crystal so that the metal is scrubbed by the sonic beam in short rapid strokes, with the path being moved over between strokes. This is a rectilinear scan, and is useful on rolled plate and extrusions. Total inspection speed is low due to the time lost in making the frequent reversals of the scanning head.

Experiments have been made using a multiple crystal holder mounted to the usual type machine driven scanner. Each crystal is in use only a small fraction of the time, since a rotating switch is used to actuate first one and then another of the search units.

Small-Diameter Ultrasonic Beam

The problem of producing a small diameter ultrasonic beam

. . .Continued on page 157

PRECISE
hole location,
easy contour
inspection with
new machine
tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

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THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

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for complete details on how you can profit by using our low-cost, time-saving KAM-GRIP Drill Jigs. These semi-automatic tools have cut costs and increased production in many plants performing secondary operations on small parts.

The descriptive literature is free and we'll be glad to send it to you.

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3/32" SHANKS

7 Standard Numbers, featuring REAL cutting teeth to remove stock faster over long periods of use—as well after regrinding as when new.

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THE POPULAR WORK BENCH SET

NO PROBLEM OF TOOTH CHIPPING OR BRAZE-FAILURE

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Furnished to you in a sturdy wooden case; Di-cor Set No. 40 is a set of 8, ¼" shank CARBIDE mills designed and instituted specifically for you, the Tool and Die Maker. Specially selected shapes – Special tooth patterns and cuts for all types of precision Tool and Die work. You will ply your skills easier and faster than ever before with these personal finishing mills. These CARBIDE mills need absolutely no coddling and will win their way to the the most favored spot on your Work-Bench! Send for complete information and prices today! Ask for Leaflet No. 645

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REGRINDING – Due to CARBO-MILLS being made of Solid Carbide repeated savings are made possible through successive regrinds.

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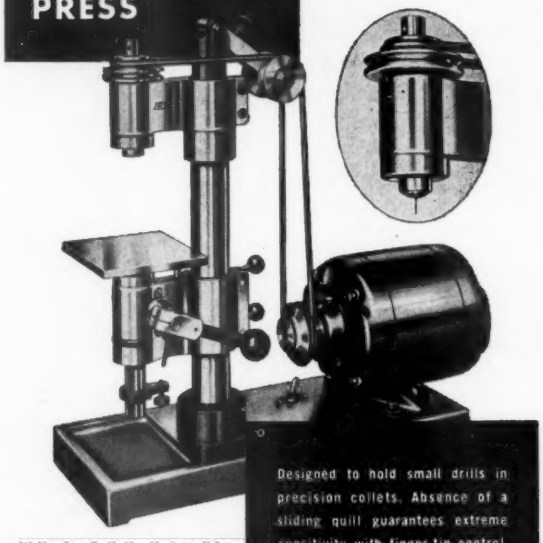
LEVIN ®

MICRO-DRILL PRESS

for holes as small as .002"



Designed to hold small drills in precision collets. Absence of a sliding quill guarantees extreme sensitivity with finger-tip control. A mounted ¼" capacity drill chuck can also be used.

Write for Bulletin H describing the Micro-Drill Press and listing collet sizes. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, California.

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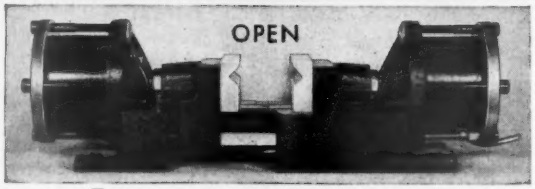

A *Precision* TOOL

designed to locate centers or other pre-determined points regardless of shape or varying sizes of parts within .001" horizontally or vertically.

Vise jaws travel on guides – actuated by opposed double-acting cylinders—synchronized by mechanical means. Force exerted is all straight line. Clamping pressures up to 2000 pounds. No pressure exerted through synchronizing mechanism. Working range 0 to 4". For centering, drilling, chamfering, hollow milling, deburring, reaming and many other production operations.

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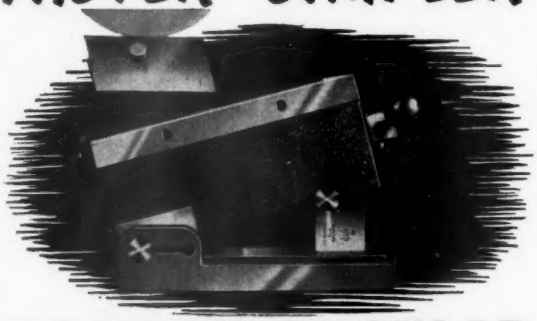

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the MAGNA-SINE

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For any angular set-up, whether single or compound, simply insert standard gauge blocks between the Magna-Sine plates. Proper gauge blocks are indicated in the Robbins Table of Constants. Positive accuracy in a few moments. Work is securely held by magnetic attraction. In two models and sizes; also non-magnetic models for inspection set-ups.

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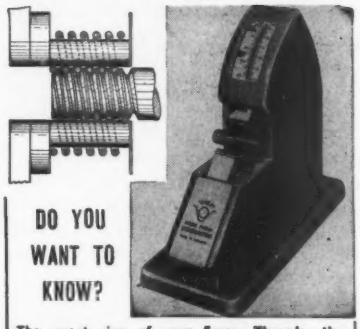

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Forged, precision machined heat treated. Tensile strength 150,000 lbs.

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BOLSTER BOLTS — dia. to 1½". Heads sq. to 3" hex. to 2⅝" T-Slot bolts, ½", ⅝", ¾" dia. lengths to 12". 1" dia. 4" to 22" long.

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SMALL LANDIS ¼" x 1" 7/16" Head

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CARAT	PRICE COMPLETE
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½	7.50
¾	12.00
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3	35.00

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CIRCLE INFORM-A-GRAM KEY NO. 157C

. . . Ultrasonics, from page 155

can be attacked from two directions. First, one must use the highest possible frequency. At 25 mc, we have found that a beam diameter of .060" is the minimum that will return good echoes. A second approach to producing a small diameter beam is to ignore the need for a parallel beam. This means that a small hole in a mask can be used to collimate the beam, if the mask is kept very close to the surface of the object being scanned.

Ability of a pulse type ultrasonic flaw detector to determine how far the flaw lies from the crystal is determined by duration of the transmitted pulse, and by the band width of the receiver that amplifies the echoes. Actually, the depth resolving power of the pulse type equipment is quite adequate for most inspection except where one is forced to work at low frequencies in order to penetrate the metal.

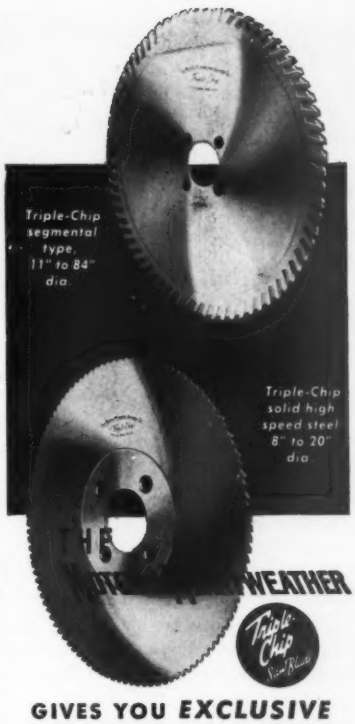
When one must inspect at 5 mc, 2¼ mc or lower, the lack of depth resolving power comes to be felt. These are the frequencies needed in the inspection of cast steel, plastics, some of the stainless steels, and many high temperature alloys. These materials could be inspected using a different type of flaw detector that obtains better depth resolution for a given operating frequency.

Frequency Modulated Flaw Detection

The frequency modulated type of flaw detector has the advantage over pulse systems in that the ultrasound is sent continuously and received continuously; thus, one is not forced to transmit a great deal of power in a very short time as in pulse transmitters. The limitation as to depth resolving power of an FM system is a function of such things as the crystal damping, the linearity of the frequency modulating device, and the width of the depth analyzing filter. These items are such that a net improvement of around 50% over pulse type systems has been realized, with further improvement to be expected as more is known about the system.

In the FM flaw detector, only one crystal is used, the same crys-

. . . Continued on page 158



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Fast, burrless cut-off of shapes and tubes up to 30" round. Let M & M Triple-Chip saw blades give you the higher *production-with-accuracy* which Industry must attain and maintain. Ask your dealer.

INVESTIGATE, TOO, THIS VALUABLE AID TO PRODUCTION

DISTINCT ADVANTAGES

For the most favorable results, time- and profit-wise, use Motch and Merryweather's superb coolant. Anti-weld averting pickup. Sharper tools and longer-lived. Oily, but not "greasy". Smokeless, odorless. A real aid to money-making production.

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Cutting Tool Manufacturing Division

715 Penton Building Cleveland 13, Ohio

Triple-Chip METHOD

REMEMBER — IT'S THE COST PER CUT THAT COUNTS!

ALL 3:

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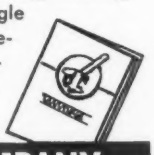
TOGGLE CLAMPS

This is *new*—Destaco's new clamp design which gives you *hardened* bushings in all series 210, 220, 228 and 240 toggle clamps. The new bushings run full length through the clamp bars for a *larger* bearing surface—and they're deeply serrated to lock in position with no chance of turning in the bars. You get a minimum of wear, smooth, accurate snap action, even under tough production conditions. A feature of our heavier series for some years, this development sets new standards for tooling requiring 500 to 800 lbs. pressures. Further improvements have been incorporated in the "wrap around" construction which strengthens the base.

For any fast clamping action in milling, drilling, welding, bonding, molding, riveting or bolted assembly operations—specify Destaco Toggle Clamps for pressures up to 4000 lbs. Consult our stocking representatives in your area, or select from our 36-page catalog describing over 45 models. Write for his name and your copy today.



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IS NOW MADE OF STAINLESS STEEL THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED

- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
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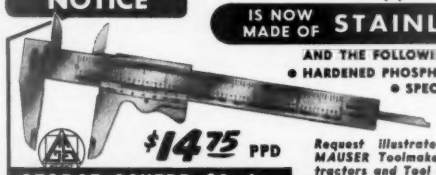
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



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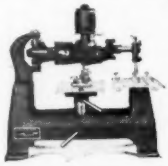
CIRCLE INFORM-A-GRAM KEY NO. 158C

. . . Ultrasonics, from page 157

tal as is used in immersed inspection. Less than 100 volts of radio frequency signal is applied to the crystal. This signal is rapidly changing frequency between approximately 4 and 6 mc when inspecting at five megacycles. The echo will arrive some time after the transmitted signal leaves the crystal and thus will have an instantaneous frequency differing from that which is currently being transmitted. This difference frequency can be measured, giving an indication of the depth to the flaw.

The circuits used to analyze the echo difference frequency are particularly applicable to distributing the same depth data to the pens of a multi-styli recorder. Each of these pens consists of a small tungsten wire bearing upon Western Union Teledeltos recording paper. This paper will turn a permanent black when electricity is applied to the tungsten styli. In the commercial version of the FM flaw detector, 33 styli are used, each representing a given depth within the metal. The recording paper is drawn under the styli in synchrony with the ultrasonic scanner. As a flaw is encountered, the appropriate styli are energized, drawing the flaw at its proper depth within the metal. This permanent record has much the same appearance as the B-scan view seen on the TV screen.

The electro sensitive recorder also records the plan view and the "A" trace record, should these be needed as an auxiliary record of the flaw encountered. The operator has the option of showing the B-scan trace on the TV screen and simultaneously recording the plan view, or he can record the B-trace when pertinent data is present. The A-trace can be shown on the large TV screen for detailed study.



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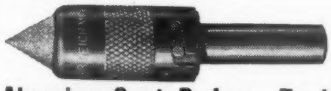

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Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, 3/8" and 3/4" Cent-R-Laps and abrasive cones in leading grits.

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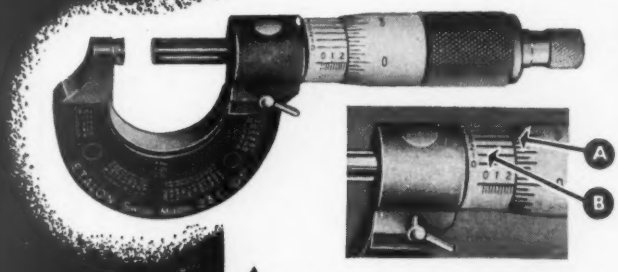

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Quick acting positive lock
Feather touch friction stop eliminates wear, assures sensitive "feel."
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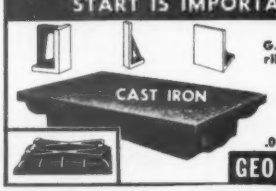

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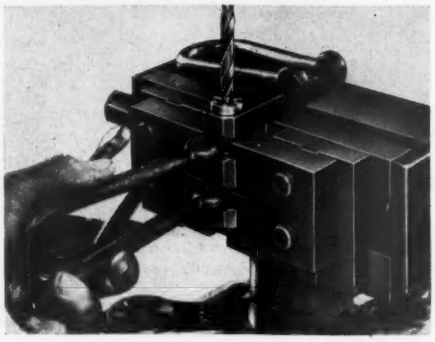

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FEATURES:
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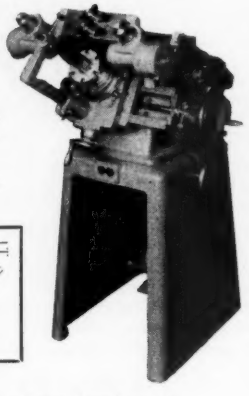

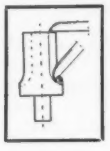

5. Minimum hand work.
6. Convenient, simple operation. Uses standard shaping tools.

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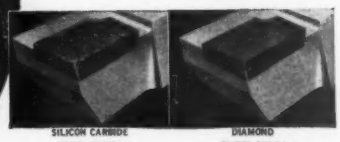
Diamond Wheel

Only $45.00



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CIRCLE INFORM-A-GRAM KEY NO. 161A

Five senior models . . . many special-purpose constructions. 50 to 200 times air line pressure. **Wedge-&-Lever Action** utilizes total cylinder drive . . . delivers greatest power grip on the work. Pat'd. Exceptional rigidity particularly suited to work-holding on **CARBIDE MILLING** and almost all milling operations. AIR OR HYDRAULIC. Write for data sheet.

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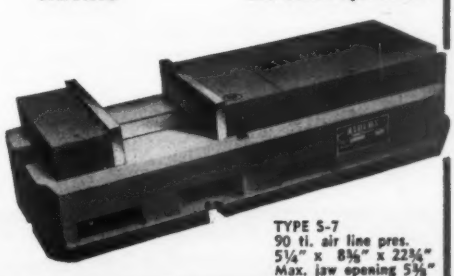
and bench operations



TYPE S-7
90 ti. air line pres.
5¼" x 8⅛" x 22¾"
Max. jaw opening 5⅛"

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NOW! SAVE ON SET-UP TIME!

With Faster Cutting

D-M-E TAPERED MILLING CUTTERS

MACHINE ANGLES, DRAFTS or RELIEFS **TOPS** **IN SMOOTH CUTTING PERFORMANCE**

WITHOUT TILTING THE MACHINE HEAD OR THE WORK PIECE!

You can take Faster, Smoother cuts, WITHOUT CHATTER. Made from the finest High Speed Steel to prevent breakage and costly "down time". You'll save Time and Money with D-M-E Tapered Milling Cutters!

FREE! Write for your convenient TABLE OF DRAFT ANGLES. Gives the actual decimal amount of draft or relief for any given depth of all angles from ½ to 30 degrees.

IN STOCK!
From ½° to 7° per side
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CIRCLE INFORM-A-GRAM KEY NO. 162A

BLANK JAWS • SINE FIXTURE KEYS • MALLEABLE
HANDLES • SHOULDER SCREWS • TEE SLOT
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SLOT NUTS • REST BUTTONS • QUARTER
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CLAMPS • FLANGE NUTS
C-WASHERS • PLASTIC BALLS
HAND KNOBS • FIXTURE KEYS

HANDY TEE-SET KIT SAVES MACHINE SET-UP TIME

The one complete Tee set-up kit in the sturdy all steel holder that hangs handy on the wall or sets handy on the table. Ends tool crib time wasting—saves set-up time on jig borers, milling machines, drill presses and other machine tools by having everything you need when you need it. Each kit contains 4 extension nut couplers; 4 flange nuts; 4 T-slot nuts; 4 strap clamps and 24 studs with stud diameters available ⅜", ½", ⅝", and ¾" with T-slot nut sizes available for each stud diameter.
Inexpensively priced—quantity discounts.

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TOOL SPECIALTY CO.
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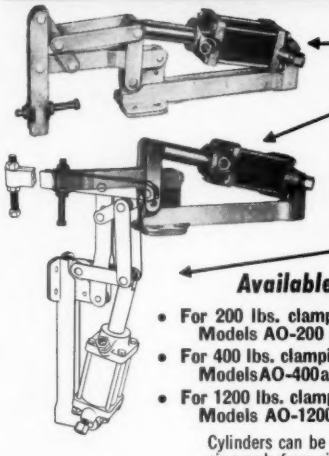
HAVE YOU HEARD ABOUT AIR-OPERATED TOGGLE CLAMPS to step up your clamping operations?



Knu-Vise (AODT-400) Double-toggle Clamp to clamp "around the corner"

Knu-Vise (AO-400) Toggle Clamp for conventional clamping.

In cases where the cylinder interferes with conventional clamping, the Double-Toggle Clamp shown at the top serves such difficult mounting situations as illustrated in the superimposed line drawing.

Available in 3 series

- For 200 lbs. clamping force Models AO-200 and AODT-200
- For 400 lbs. clamping force Models AO-400 and AODT-400 (illustrated)
- For 1200 lbs. clamping force Models AO-1200 and AODT-1200

Cylinders can be easily rotated to suit air supply from either left or right side.

Send for complete information.

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CIRCLE INFORM-A-GRAM KEY NO. 162B

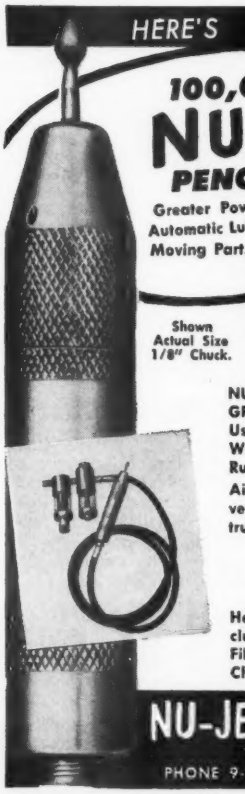
HERE'S THE NEWEST

100,000 R.P.M.

NU-JETT PENCIL GRINDER

Greater Power — New Safety Guard — Automatic Lubrication. Weighs 5 oz.—One Moving Part.

Shown Actual Size 1/8" Chuck.



NU-JETT DOES ANY FINE PRECISION GRINDING, POLISHING, FINISHING. Use it for Etching, Deburring, Die Work, Carving on Wood, Metal, Rubber and Plastic.

Air driven on 50 lbs. pressure or more, very smooth in operation, compact, it truly handles like a pencil.

New Low Cost Package **$42.50**

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CIRCLE INFORM-A-GRAM KEY NO. 162D

Tiny Wire Drawing Die Accurate to .0002", Easily Form Ground With Diaform

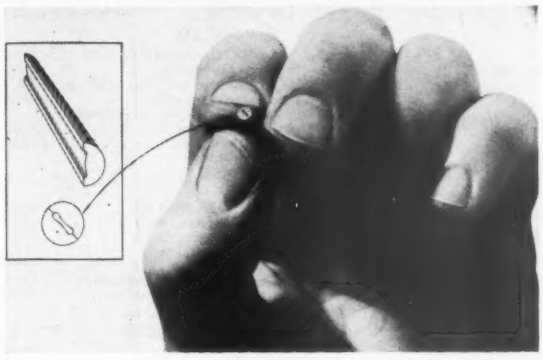

Photo courtesy Pratt & Whitney, Div. Niles-Bement-Pond Co.

The Pratt & Whitney Diaform wheel forming attachment was recently put to a unique test when one owner used it in the grinding of a tiny split wire drawing die having a tolerance of ± .0002".

The small size of the die together with extremely close tolerances necessitated the making of a preliminary template on a hundred-to-one ratio instead of the usual ten-to-one. This 100 to 1 template made of 3/32" flat stock was then used with the Diaform and 100-GV wheel to produce the ten-to-one regular template.

Two pieces of correct diameter wire were then placed in a "V" block and ground with a Diaformed wheel to the required form and thickness. The illustration shows the tiny size of the split die being held together, with a greatly enlarged drawing shown at the left.

IMMEDIATE DELIVERY
on SOCKET HEAD CAP SCREWS

. . . Up to 12" Long!
on ½", ⅝" and ¾" Dia. Screws
and No Special "Set-Up Charges"

WHY HOLD UP YOUR WORK . . . for long deliveries on those so-called "special length" screws? You can get really fast service on high-quality Socket Head Cap Screws, Stripper Bolts and Dowel Pins . . . AND you don't have to pay special set-up charges either! D-M-E's large volume turn-over enables you to get in on the savings!

SO . . . Why Wait? . . . When you can get the Finest Quality, in Less Time, and at Less Cost to you!

. . . for 1 or 100!

In STOCK at ALL 5 D-M-E Branches

Write for your FREE TABLE of TAP DRILL SIZES and Helpful Cap Screw Data . . . TODAY!

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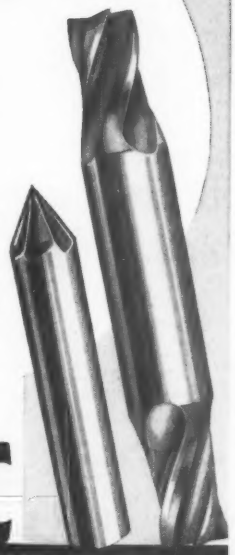
CIRCLE INFORM-A-GRAM KEY NO. 163A

RAYMAC
SOLID CARBIDE
END MILLS AND CENTERLAPS



Raymac Solid Carbide end mills and centerlaps assure you precision workmanship, long tool life and minimum down time, plus the advantages of a specific tool for individual applications.

Write today for complete technical information.

RAYMAC
MANUFACTURING COMPANY INC.
3729 CASS AVENUE, DETROIT 1, MICH.

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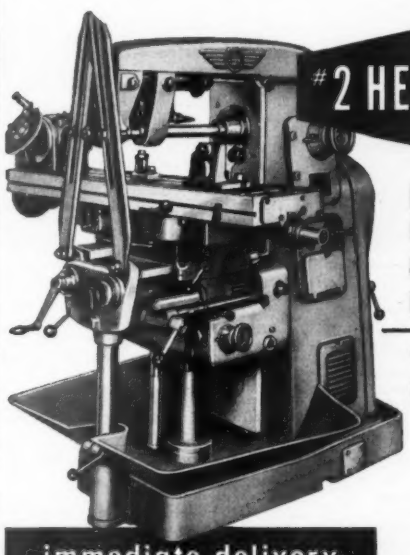
#2 HERCULES
plain, universal and vertical millers



for tool room & production work

work table 12" x 51"

immediate delivery

The #2 HERCULES Milling Machines have hardened and ground gears, power rapid traverse in all directions, 12 spindle speeds and feeds.

write or phone for full details

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158 Pioneer St., Brooklyn 31, N. Y.
TRiangle-5-2103 and 2157

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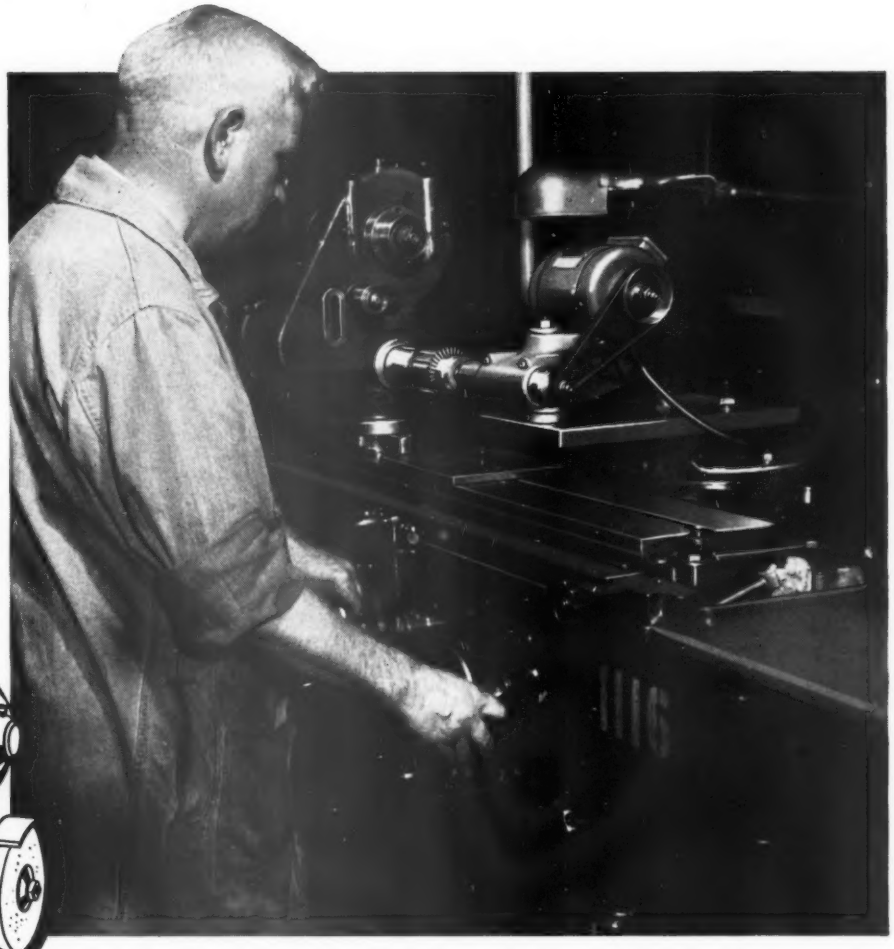
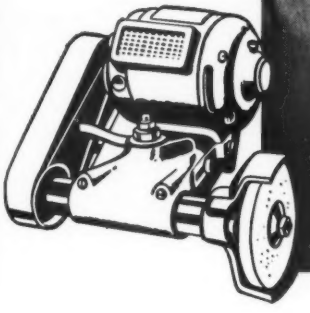
26-year record proves DUMORE® GRINDERS give low-cost, accurate service



Mounted on a Universal Grinder, the Dumore operates at a spindle speed of 40,000 rpm. Work speed is 300 rpm.



How DUMORE insures high-speed internal grinding with mirror finish . . . at low cost

MANUFACTURING drill chucks requires a difficult jaw grinding operation. Smooth finish and correct back taper are necessary. And each day, the grinder must stand up under millions of hammer-like blows transmitted by the jaws to the grinding wheel and spindle bearings.

Since 1927, this chuck manufacturer has used DUMORE precision grinders. Here is his report:

"Our Dumore No. 5 units operate 100 hrs. per week for the internal grinding of 3 open jaws for our ⅛" to 1" plain bearing key type chucks. The material is 60 Rockwell C hardness alloy steel and we remove .005".

"The Dumores are well adapted to this fine work and produce a glass-like finish. Their sturdy power transmission, solid spindle shaft, self-oiling features, air-cooled motor and variable speeds make them exceptionally well suited for this work. They deliver continuous operation with little effort and very low maintenance cost."

If you are seeking a way to improve your internal grinding operations, investigate the advantages Dumore grinders can provide. Get the details from your industrial distributor or write direct:

DUMORE PRECISION TOOLS

The Dumore Company

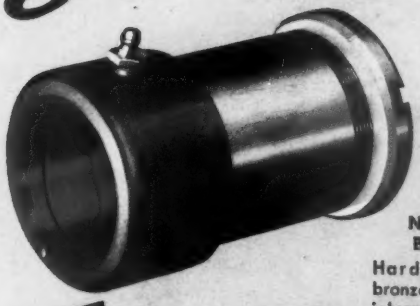
1313 Seventeenth Street • Racine, Wisconsin

Lamina GUIDE BUSHINGS

LONG WEARING HARDENED STEEL

Bronze Plated

WILL NOT SEIZE OR SCORE



NUT TYPE BUSHING
Hardened steel, bronze plated—nut is located in counterbore for flush assembly.

TOE CLAMP TYPE BUSHING
Hardened steel, bronze plated—secured in shoe by means of toe clamps.

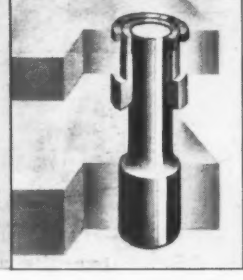
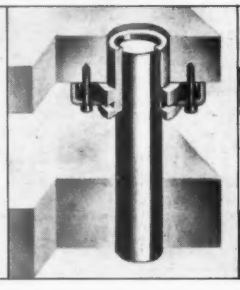
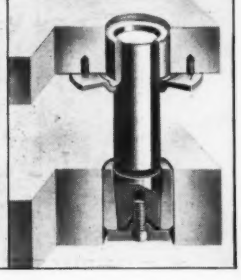
RING CLAMP TYPE BUSHING
Hardened steel, bronze plated—secured in position by a clamping ring.

LAMINA steel-backed, bronze electroplated bushings combine the long wearing service of hardened steel with the free, smooth action of bronze.

LAMINA bushings do not require honing, reaming or scraping after assembly. Perfect alignment and free action are always maintained when properly assembled.

LAMINA bushings are designed with three types of retainers: spanner nut, toe clamp and ring clamp. These methods of holding the bushing in position eliminate the necessity of depending on a press fit, which in many cases causes distortion.

USED WITH ALL TYPES OF LAMINA GUIDE PINS

NUT TYPE BUSHING SHOWN WITH SHOULDER PIN	TOE CLAMP BUSHING SHOWN WITH STRAIGHT PIN	RING CLAMP BUSHING SHOWN WITH REMOVABLE PIN
		

Precision die sets equipped with LAMINA Bronze Plated Bushings and LAMINA Tool Steel Guide Pins, can be secured, upon request, from most die set manufacturers.

For additional information and latest literature call or write ——————→

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